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THE INTENSITY AND TYPE OF HOOKWORM INFESTATION IN THE INGHAM DISTRICT OF NORTH QUEENSLAND.[1]

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HITHERTO the survey work which forms the basis of hookworm control campaigns, has been confined in Australia to the determination of the number and distribution of infested persons. That it is important to know not only the percentage of persons infested, but the average intensity of their infestation, is, however, a fact on which much emphasis has been laid in recent years. In general only heavy infestations produce severe disease, and treatment campaigns often do good by reducing intensity, although their effect on percentage incidence may be far less noticeable.

Intensity estimations are based on counts of the number of eggs per gramme of fæces; only average figures derived from counts on a number of persons have any significance. Since the number of eggs per gramme may vary in fæces of different consistencies, even though the total egg output is the same, certain factors evolved by American investigators have come into use for correcting the eggs per gramme figure for fæcal consistency. These factors have been adopted in this paper, though with some hesitation, since it is admitted that they are far from being entirely satisfactory.

The usual practice has been followed of expressing the intensity simply in terms of numbers of eggs per gramme; the factors sometimes used for

[1] The work recorded in this paper was carried out by the cooperation of the Australian Institute of Tropical Medicine and the Hookworm Campaign under the general direction of Dr. R. W. Cilento, Director of the Division of Tropical Hygiene, Commonwealth Department of Health.

deducing from the number of eggs the number of worms harboured are not considered to be sufficiently reliable to justify their employment.

The following report contains the results of a series of egg counts, before and after treatment, together with a simultaneous determination of the genus of worm predominantly present in each individual. The latter information was obtained by microscopical examination of the mature larvæ obtained from artificial cultures. The laboratory work was carried out at the Australian Institute of Tropical Medicine, Townsville, and the field work by a unit of the Australian Hookworm Campaign, at that time engaged in an intensive survey of the district. The investigation commenced in July and finished in November, 1929.

Hookworm control work has been regularly carried out in the Ingham area since 1919, the present survey being the sixth. The method employed in intensive campaigns has included: (i) Examination by Willis flotation of fæcal specimens from the great majority of the population of the area as ascertained by a preliminary census. (ii) Treatment of all those found to be infested with hookworms.

The Ingham district is situated sixty miles north of Townsville, in latitude 18° south, and consists of a narrow coastal plain lying between the main coast range and the sea. The average rainfall is about eighty inches *per annum*, the climate hot and humid, and the conditions of rainfall and humidity uniform throughout the area. During the progress of this investigation the weather was unusually dry, practically no rain falling from April to the middle of November, and cane planting was seriously hampered. Normally the bulk of the rain falls between January and April, that is, in the summer, but midwinter rains are also the rule.

The district is dependent on sugar growing for its existence and a population of 8,000 people is thus supported. Two sugar mills (Victoria and Macknade) treat the cane, and in the crushing season a moderate floating population is employed in these mills and in cane cutting gangs. Between crushings some of these men return to non-infested and some to lightly infested districts, the town of Ingham itself being included in the latter category. Others are reemployed in general farm work. Therefore, the cane cutting gangs, though living under the same conditions and exposing themselves to infection equally with farmers and farm labourers for part of the year, may not do so so continuously.

There are no industries in the town which call for special mention, and the lower scale of intensity found there is due to better sanitation and different personal habits, such as the constant use of footwear.

Ingham is the only large town and is served by a double pail sanitary service, the night-soil being disposed of by burial. A small town, Halifax, also has this system, and the two sugar mills provide sanitary services for their own employees. In the rural areas night-soil is usually collected in pans or kerosene tins and subsequently buried on the farm, but often it is merely thrown amongst the cane. A large amount of soil pollution is also caused by miscellaneous single stools deposited throughout the fields and in sheltered spots around the houses. Figures taken from the 1927 survey show that about 10% of the farm residences were not provided with a privy and 75% of the existing privies would permit soil pollution. Continuous efforts are being made by the health authorities to improve the privy standard.

British people and their descendants form the majority of the population, but lately southern Europeans (mostly Italians) have rapidly increased in the farming areas. Ingham town has not been invaded to the same extent and is still overwhelmingly British. Two main groups can therefore be distinguished: (*a*) Southern Europeans (Italians, Spaniards, Greeks and Maltese), (*b*) all other whites (persons of English, Scottish and Irish stock; rarely other northern Europeans). The remaining population consists of a few aborigines, orientals and Melanesians, the latter being the remnants of labour gangs imported many years ago for work in the cane fields.

Collection and Examination of Specimens.

At the commencement of this investigation a field unit had already begun an intensive survey of the incidence of hookworm in the whole district, but the present investigation deals with three rural subareas only out of the nine into which the district was divided for survey purposes. The climatic conditions are uniform for all subareas, and the factors of race, occupation, sanitary and soil conditions were considered to be representative in the selected subareas which were chosen after a consideration of the results of previous incidence surveys.

All "positives" in Ingham township and in the three rural subareas were examined by the Caldwells' (1926) antiformin-sugar ova counting technique.

The following system of collection and examination of samples was followed:

Large specimen containers (cigarette or film tins), each bearing the name of a person from whom hookworm ova had been recovered, were issued on two fixed days in each week with instructions that they were not to be filled until the following morning. Next morning the same field inspector collected these tins and dispatched the filled ones by that afternoon's train to Townsville together with the census card for each person. Four or five hours later they were collected at their destination, cultured for the determination of the larval genus and then placed in a cold chamber having an average temperature of 6° C.

By this method less than twenty-four hours elapsed before the specimen was cooled, and at this low temperature it was found that no loss of eggs occurred (see Table I). Stoll (1929), in his work in Panama, also found that low temperatures kept the specimens satisfactorily for at least ten days.

At intervals extending up to a week after receipt the specimens were withdrawn from the cold room

TABLE I.

Effect of Cold Storage on Hookworm Ova in Fæces.

Recounts.		Original Counts.	
Time Intervals from Original Counts.	Mean Number of Eggs per Gramme.	Mean Number of Eggs per Gramme.	Number of Specimens.
Under 1 week ..	9,220	8,500	11
1–2 weeks	1,400	1,800	1
2–3 „	3,625	4,275	4
3–4 „	4,700	3,965	6
4–8 „	6,775	6,525	4
All Specimens ..	6,640	6,240	26

and the eggs counted, 3·5 grammes of fæces being used in a final dilution of 35 cubic centimetres; all results were brought to a formed fæces basis. Graduated 0·1 cubic centimetre pipettes were used for placing 0·1 cubic centimetre of the diluted fæces on a slide and were washed out with clean sugar solution; the washings were added to the slide and included in the count. At first two counts were performed on each specimen, but later, considering the many other sources of error affecting egg counts, it was thought sufficient to perform one count only. If the two sugar films contained no ova, but Clayton Lane's direct centrifugal flotation technique revealed ova, the count was entered as twenty-five eggs per gramme.

The classifications of fæces received were as follows: formed 43%, soft formed 27%, mushy 29%, diarrhœic 1%.

All adults were treated with a combined vermifuge of oil of chenopodium, one mil (sixteen minims), and carbon tetrachloride, two mils (thirty-two minims); children were given 0·12 mil (two minims) of carbon tetrachloride and 0·06 mil (one minim) of oil of chenopodium per year of age. Between two and four weeks after this treatment a further fæcal specimen was counted, exactly the same system of collection and examination being used.

Identification of Larvæ.

All specimens received were cultured for a determination of the genus of worm present.

Two grammes or more of fæces were emulsified with water in a tin by stirring with a wooden spatula. Dry helminthologically sterile earth was then added and stirred in until the surplus moisture was absorbed and the culture was set aside and protected by a cover from excessive evaporation and contamination by flies. After six or seven days the upper half of the culture was removed and placed in a modified Baermann apparatus and the infective larvæ collected in a round bottomed glass vessel. They were killed by exposure to sunlight, or more usually by heating them over a flame. The genus, *Ancylostoma* or *Necator*, to which the larvæ belonged, was then determined by examination of the buccal cavity (Heydon, 1927), a magnification of 100 diameters being used. It was necessary occasionally to use a higher power (300×) for diagnosis of individual larvæ, but after some little practice thirty larvæ could be found and identified in five minutes. Coverslips were applied so that the larvæ could be rotated and viewed from a different aspect, as was occasionally found desirable.

No worm counts were made, nor was any attempt made to determine the daily average output of fæces per person. Under Australian conditions these are very difficult to obtain, except in special circumstances, such as those under which the worm counts by Sawyer and Sweet (1924) in the Sandy Gallop and Goodna Mental Asylums were obtained.

Egg Counts in the Town of Ingham.

The results have been arranged to show comparative figures for different sexes and for race, age and intensity groups in both town and country areas. In addition, the investigation of the genus of hookworm present has introduced a further group, the reliability of which will be discussed later. It should also be pointed out that the division into town and country gives a division by occupation and by sanitation. Within the town boundaries the privies are usually well kept, no home disposal of night-soil is allowed, little promiscuous defæcation occurs and, except amongst children, the use of footwear is general. As already indicated, the townspeople are mainly of British stock, while on the farms the southern Europeans are now slightly in the majority.

Table II shows the incidence by race and sex in the single large town in the district (Ingham).

TABLE II.

Ingham. Incidence by Race and Sex.

Race.	Males.			Females.			Both Sexes.		
	Census.	Number Infested.	Percentage Infested.	Census.	Number Infested.	Percentage Infested.	Census.	Number Infested.	Percentage Infested.
Southern Europeans ..	153	7	4·6	130	6	4·6	283	13	4·6
All Other Whites	719	34	4·7	756	16	2·1	1,475	50	3·4
Chinese	27	1	—	16	0	—	43	1	—
Japanese	7	1	—	0	0	—	7	1	—
Pacific Islanders	1	0	—	1	0	—	2	0	—
Aborigines	3	1	—	2	1	—	5	2	—
TOTALS	910	44	4·8	905	23	2·5	1,815	67	3·6

TABLE III.
Ingham. Intensity by Race and Sex.

Race.	Males.		Females.		Both Sexes.	
	Number.	Mean Number of Eggs per Gramme.	Number.	Mean Number of Eggs per Gramme.	Number.	Mean Number of Eggs per Gramme.
Southern Europeans	6	1,020	4	960	10	995
All Other Whites	(*a*) 33 (*b*) (32)	1,634 (913)	15	321	48 (47)	1,224 (724)
Chinese	1	300	—	—	1	300
TOTALS .. .. (*a*)	40	1,500	19	455	59	1,170
TOTALS .. .. (*b*)	39	906	19	455	58	758

Egg counts were made on 59 of these 67 Ingham specimens containing ova, and Table III shows intensity (mean eggs per gramme) by race and sex.

In this table (III) the figures opposite (*a*) in the category "all other whites" and also in the totals are those derived from the whole of the cases; the figures opposite (*b*) in each instance are those obtained after the exclusion of one exceptional case, an Australian born male of British descent, aged nineteen years, employed in a timber yard; he had a count of 24,700 eggs per gramme, more than three times the next highest count in any category.

The lower values are probably nearer the truth, as a number of southern Europeans living in town had recently moved in from the country and these would be expected to carry higher infestations.

Table IV shows intensity by age groups and sex and the figures opposite (*a*) and (*b*) are derived as in Table III. The small number of individuals in each age group and the low counts generally found give a preponderating effect to the small number of high counts. Only two counts over 4,000 eggs per gramme were obtained, both in males, one in each of the age groups 15-19 years and 20-29 years. The figures opposite (*b*) in the 15-19 years group exclude the heavier of these two cases, and show for both sexes taken together a rising intensity to the 10-14 years group and a falling away afterwards; a similar age distribution in the males alone is obtained only if the heaviest case but one is also excluded when the average count for the 20-29 years group falls to 733 eggs per gramme. In an Australian community such as this, previous surveys have often indicated that the maximum incidence (percentage infested) falls in the school age.

The incidence of hookworm in the town as shown in Table II is 3·6%. This has been analysed in terms of egg count groups in Table V, using the system of grouping recommended by Cort, Stoll and Grant (1926), but with one extra group (800 to 1,199 eggs per gramme) introduced to show more clearly the large proportion of low counts.

Thus the incidence and intensity of hookworm in this sanitated area is negligible and is not likely to increase under the present methods of control. The continual exchange of population between rural and town areas will keep the incidence at a certain level, but only in rare cases will the intensity be so great as to cause actual hookworm disease.

TABLE IV.
Ingham. Intensity by Age Groups and Sex.

Age Groups. (Years).	Males.		Females. (Ten-Year Groups.)		Both Sexes.	
	Number.	Mean Number of Eggs per Gramme.	Number.	Mean Number of Eggs per Gramme.	Number.	Mean Number of Eggs per Gramme.
0–4	0	0	—	—	1	100
5–9	7	524	3	392	9	527
10–14	9	1,400	—	—	10	1,262
15–19	(*a*) 9 (*b*) (8)	3,400 (730)	3	270	(*a*) 11 (*b*) (10)	2,848 (662)
20–29	7	1,121	9	614	16	711
30–39	5	820	3	650	8	756
40 and over	3	427	1	300	4	395
TOTALS .. .. (*a*)	40	1,500	19	455	59	1,170
TOTALS .. .. (*b*)	39	906	19	455	58	758

TABLE V.

Ingham. Analysis of Positives by Egg-count Groups.

Intensity Groups.	Number.	Percentage of Positives.	Percentage of Total Town Population.
Negative	1,748	—	96·80
1–399 e.p.g. ..	28	47·5	1·55
400–799 ,, ..	10	17·0	0·55
800–1,199 ,, ..	10	17·0	0·55
1,200–2,999 ,, ..	8	13·5	0·45
3,000–9,999 ,, ..	2	3·4	0·10
10,000 and over	1	1·6	0·05

Egg Counts in the Rural Population.

Of the nine subareas, three, Bambaroo, Macknade and Toobanna, were selected for egg count work, mainly on account of their proximity to the railway. The incidence in most of the subareas has always been about equal and Macknade and Toobanna, containing nearly equal numbers of the two main racial groups at the last census, were considered representative. In Bambaroo, however, which is an isolated subarea in which the good cane land occurs only in patches along the creeks, the percentage of positives has always been below the average. The factors of rainfall, climate and altitude are similar in all the subareas.

The incidence among "all other whites" in the Toobanna subarea is perhaps somewhat increased by the circumstance of its lying across the main southern road. Ease of communication with the township combined with cheap rentals has attracted numbers of the poorer class of town-dweller into the subarea.

The figures in Tables VI and VII would suggest that the problem of hookworm control in this district lies in the southern European rural population, and in the subsequent tables this group alone is represented. In the "all other whites" group, although all available positives were secured, their number is too small. It may be noted, however, that the intensity and incidence of the "all other whites" group is not higher than that of the same group in the township (see Tables II and III) and that no single count of over 3,000 eggs per gramme was found. The four Malays with high average counts may be disregarded, as practically no other Malays are now left in the district. These four old men were engaged in market gardening and were interesting in that three of them, accounting for nearly 100% of their ova, were infested with *Necator*, though they were surrounded by a population 90% of whom yielded only *Ancylostoma* larvæ. A possible explanation is, of course, that they were constantly reinfecting themselves and that their worms were the descendants of those originally acquired in their native land.

The definite tendency towards high counts during childhood will immediately be noticed much more marked in males than females. In Table IX three divisions have been made which are intended to compare intensities during infancy, school age and working age, and the position is clearly shown therein.

It seemed probable that there would be some difference in intensity between cane cutters and those persons engaged continuously on farm work and therefore in more frequent contact with polluted soil. Some confirmation of the supposition was obtained as in a total of 63 southern European males, 21 cane cutters averaged 1,680 eggs per gramme and 42 farmers and farm labourers averaged 3,215. No heavy counts over 10,000 eggs per gramme occurred in the former, but four were above this figure in the latter class.

Several outstanding instances of foci of heavy infestation were found in this rural southern European group, for in eight households 17 persons, equal to 10% of the whole group, were responsible for 47% of the ova. And of these 17, nine individuals from five families, 5·5% of the whole group, delivered 34% of the eggs. Similarly in the "all other whites" group in the town of Ingham 61% of the ova came from four persons, 7% of the whole group. Therefore, if these 21 persons alone were given special attention and their infestation reduced to a low figure, the whole aspect of the tables would alter. The positives in the town area would then have an average of 500 eggs per gramme and the rural southern Europeans 1,700 eggs per gramme, or half the actual figure.

Effect of Treatment on Egg Counts.

Recounts after One Treatment.—A vermifuge consisting of, for adults, two mils (thirty-two minims)

TABLE VI.

Rural Sub-Areas. Incidence by Race and Sex.

Sub-Area.	All Other Whites.						Southern Europeans.						Total.	
	Males.		Females.		Total.		Males.		Females.		Total.			
	Census.	Percentage Infested.	Census.	Percentage Infested.	Census.	Percentage Infested.	Census.	Percentage Infested.	Census.	Percentage Infested.	Census.	Percentage Infested.	Census.	Percentage Infested.
Macknade ..	232	3	158	1·3	390	2·3	367	31·1	157	25·5	524	29·4	945	17·7
Toobanna ..	122	12·3	85	3·5	207	8·7	119	19·3	61	6·6	180	15·0	387	11·6
Bambaroo ..	156	0·7	104	1·9	260	1·16	89	13·5	41	4·9	130	11·5	393	4·8
	510	4·5	347	2·0	857	3·5	575	26·5	259	17·5	834	23·5	1,725	13·2

TABLE VII.

Rural Sub-Areas. Intensity by Race and Sex.

Race.	Males.		Females.		Both Sexes.	
	Number Infested.	Mean Number of Eggs per Gramme.	Number Infested.	Mean Number of Eggs per Gramme.	Number Infested.	Mean Number of Eggs per Gramme.
Southern Europeans	121	3,055	45	2,187	166	2,830
All Other Whites	12	715	4	169	16	578
Malays	4	11,075	—	—	4	11,075
Pacific Islanders..	1	450	1	100	2	225
All Races..	138	3,050	50	1,984	188	2,777

TABLE VIII.

Rural Sub-Areas. Intensity by Age Groups and Sex in Southern Europeans.

Age Groups (Years).	Males.		Females.		Both Sexes.	
	Number Infested.	Mean Number of Eggs per Gramme.	Number Infested.	Mean Number of Eggs per Gramme.	Number Infested.	Mean Number of Eggs per Gramme.
0–4	4	6,615	5	1,230	9	3,622
5–9	9	4,175	12	2,760	21	3,370
10–14	11	6,810	7	2,270	18	5,046
15–19	7	3,960	3	2,100	10	3,402
20–29	48	2,270	4	2,375	52	2,278
30–39	33	1,975	8	1,675	41	1,916
40–49	3	5,470	5	2,700	8	3,740
50 and over	6	2,066	1	500	7	1,843
All Ages	121	3,055	45	2,187	166	2,830

TABLE IX.

Rural Sub-Areas. Intensity by Infant, School and Working Age Groups in Southern Europeans.

Ages.	Males.		Females.		Both Sexes.	
	Number.	Mean Number of Eggs per Gramme.	Number.	Mean Number of Eggs per Gramme.	Number.	Mean Number of Eggs per Gramme.
0–4 years	4	6,615	5	1,230	9	3,622
5–14 years	20	5,625	19	2,582	39	4,143
15 years and over	97	2,378	21	2,058	118	2,321

of carbon tetrachloride and one mil (sixteen minims) of oil of chenopodium was distributed to all persons found "positive" in the field by the Willis diagnostic examinations. The doses for children were, per year of age, 0·12 mil (two minims), of carbon tetrachloride and 0·06 mil (one minim) of oil of chenopodium. It was directed that these drugs were to be taken in the morning on an empty stomach and followed in one or two hours by a saline purge. These treatments were delivered, if at all possible, direct to the person concerned, and the printed instructions for use were then supplemented by verbal information from the medical officer or field inspector. It was exceptional to meet with opposition, either to supplying specimens or accepting treatment, and the southern Europeans were especially good cooperators in both these matters. It was therefore surprising to find that 37 of the 157 treated individuals gave higher counts than before. As the dry weather conditions would keep the amount of reinfestation at a minimum, it seems obvious that many treatments were not properly taken, or were not taken at all. Treatments are generally taken over the week-end, so that the patient need not lose any working time if ill effects follow the taking of the drugs.

TABLE X.

Rural Sub-Areas. Analysis of Positives by Egg-count Groups in Southern Europeans

Group.	Males.		Females.		Both Sexes.	
	Number.	Percentage of Total Males.	Number.	Percentage of Total Females.	Number.	Percentage of Total Persons.
Negatives	423	73·5	214	82·6	638	76·5
1–399 e.p.g.	27	6·0	5	1·9	32	4·55
400–799 „	18	4·0	9	3·5	27	3·9
800–1,199 „	13	3·0	5	1·9	18	2·6
1,200–2,999 „	28	6·0	19	7·3	47	6·5
3,000–9,999 „	26	5·5	6	2·3	32	4·55
10,000 and over	8	2·0	1	0·5	9	1·3

Before a fæcal specimen was secured for recount, an interval of from a fortnight to a month was allowed to elapse from the week-end following the distribution of the treatment.

TABLE XI.

Reduction of Egg Output following One Treatment.

Group.	Number of Cases.	Mean Number of Eggs per Gramme (First Counts).	Mean Number of Eggs per Gramme (Recounts).	Percentage Reduction of Eggs.
Southern Europeans	115	2,972	1,640	45
All Other Whites	37	480	184	60
Total for All Races and Types of Infestation	157	2,960	1,310	66
Ancylostoma infestation only	129	2,944	1,577	46
Necator infestations only	17	1,970	35	98

The 37 cases showing no reduction of intensity after the issue of a treatment were all *Ancylostoma* infestations, but if this non-reduction be regarded as evidence that no treatment had been taken, then the percentage reduction would be altered as shown in Table XIA.

TABLE XIA.

Reduction of Egg Output following One Treatment, excluding Cases showing an Increased Count.

Infestation.	Number of Cases.	Mean Number of Eggs per Gramme (First Count).	Mean Number of Eggs per Gramme (Recount).	Percentage Reduction of Eggs.
Ancylostoma infestations only	92	3,450	1,080	66
Necator infestations only	17	1,970	35	98
Total for All Infestations	120	3,350	850	75

Soper (1925), in his work on the efficacy under controlled conditions of various anthelmintics, obtained, with a mixture of 1·8 cubic centimetres carbon tetrachloride and one cubic centimetre oil of chenopodium, reductions of 84% in female ancylostomas and 99·8% in female necators.

Effect of Treatment on Incidence.

The figures in Table XII show the reduction of incidence in the 157 persons who were examined before and after being supplied with a single dose of the drugs; the 37 individuals who presumably did not take them are included. A specimen was classed as "negative" only after examination by both Caldwell's and Clayton Lane's diagnostic techniques.

TABLE XII.

Reduction of Incidence following One Treatment.

Group.	Number Reexamined.	Number Negative.	Percentage Reduction.
Ingham Town	35	16	45
Rural	122	27	22
Ancylostoma duodenale	129	22	17
N. americanus	17	16	95
Mixed infestation	11	4	37

Species of Worm Present.

All specimens on which an egg count was performed were also cultured to obtain infective larvæ for microscopical diagnosis. In seven specimens which failed to yield larvæ, eggs had been demonstrated by flotation technique, while three others in which no ova were found yielded larvæ on culture. It was found more difficult to obtain good yields of larvæ from *Necator* than from *Ancylostoma* ova, though a more suitable method of preparing the culture in the later stages of the investigation helped greatly in rectifying this source of error. This method consisted in thorough liberation and partial washing of the ova by emulsification of the specimen in a large volume of water; after sedimentation of the ova the supernatant fluid was discarded and the deposit poured on to dry earth.

Good yields were readily obtained from cultures of specimens containing *Ancylostoma* ova, and it

was found that in several respects they were hardier than the *Necator* ova. Their resistance to cold, as shown in Table XIII, and their greater percentage of development under equal conditions of collection, storage and culture are instances of this. In the experiments tabulated in Table XIII weighed quantities of fæces were used and the number of larvæ recovered was counted. In each case the percentage recovery of larvæ is calculated against the original Caldwell egg count figure.

TABLE XIII.

Loss of Viability of Ova in Fæces kept at a Low Temperature.

Time of Exposure to a Mean Temperature of 6° C.	*Ancylostoma.*		*Necator.*	
	Specimens Cultured.	Percentage of Larvæ Recovered.	Specimens Cultured.	Percentage of Larvæ Recovered.
Immediate culture	11	75	1	15
1 day	2	40	—	—
2 days	2	30	—	—
7 ,, ...	2	10	1	1
12 ,, ...	—	—	2	0·5
4 weeks	2	1	1	—
5 ,, ...	4	1	—	—
6 ,, ...	3	0·5	—	—
7 ,, ...	1	—	—	—
8 ,, ...	4	—	—	—
75 days	2	—	—	—
105 ,, ...	1	—	—	—

While, as shown in Table XIII, the mean temperature of the cold room used was about 6° C., it varied between extreme limits of 2° C. and 8° C.

Eggs which had been kept in this room both in water and fæces for a day or two and then placed at room temperature in conditions favourable to their development, were often observed at intervals under the microscope. In many such eggs development proceeded, though slowly, to the formation of a tadpole larva of abnormal appearance, which, after lingering on for some days, during which it exhibited twitching movements, finally died.

The Figures of Table XIV are derived from the microscopical examination of some of the larvæ obtained by culture from each specimen; the average number of *Ancylostoma* larvæ examined from each culture was 29, but from *Necator* cultures only 16. The real number of mixed infections doubtless exceeded considerably that detected, since the examination of a few larvæ determines only which species is more numerous.

TABLE XIV.

Species of Worm by Race.

Genus of Larva.	All Other Whites.	Southern Europeans.	Malays.	Pacific Islanders.	Japanese.	Total.
Ancylostoma	38	161	1	—	1	201
Necator ..	17	8	2	1	—	28
Mixed ..	8	3	1	—	—	12
TOTAL ..	63	172	4	1	1	241

It has further to be remembered as limiting any pretensions of these figures to represent the exact relative incidence of the two species of worms that the egg output of *Ancylostoma duodenale* is greater than that of *Necator americanus*, probably several times greater, and that as already remarked inferior cultural results were obtained with *Necator* ova.

The effect of these factors would be to underestimate the number of mixed and overestimate the number of pure *Ancylostoma* infestations present. It is of interest to note that the opposite tendency would result from figures based on worm counts following a vermifuge, the *Necator* adults being easier to dislodge. Table XIV also shows that *Ancylostoma* infestations were found in 95% of the southern European specimens examined, in 66% of the "all other whites," and in 90% of the specimens from all races.

In the previous survey (1927) larval cultures on 170 specimens were reported, returning 92% and 50% *Ancylostoma* respectively for the southern European and "all other whites" groups, but no details were given of mixed infestations. Forty-one examinations of southern Europeans in a similar district (Innisfail) also showed a low *Necator* incidence, only one case being found, whilst forty were *Ancylostoma*.

Table XV shows the relation of intensity and of the species of worm present to race and to sanitation.

TABLE XV.

Species of Worm, with Intensity, in Sanitated and Unsanitated Areas.

Genus of Worm.	Town.				Rural.			
	All Other Whites.		Southern Europeans.		All Other Whites.		Southern Europeans.	
	Number.	Mean Number of Eggs per Gramme.	Number.	Mean Number of Eggs per Gramme.	Number.	Mean Number of Eggs per Gramme.	Number.	Mean Number of Eggs per Gramme.
Ancylostoma	(*a*) 30 (*b*) 29	1,750 960	9	1,060	7	825	152	2,714
Necator	11	290	1	400	4	144	8	1,610
Mixed	3	920	—	—	5	580	(*a*) 3 (*b*) 2	14,500 600

The figures against (*b*) exclude single individuals with very high counts.

Discussion and Conclusions.

The foregoing results are from a complete survey of the townspeople; and from rural areas a numerically large sample of southern Europeans and a numerically small sample of "all other whites." If an adequate number of the latter group had been available and the low intensity rate had been maintained, it would have been a simple matter to apply the results to the total population. Under these conditions we should have an equally low infestation in "all other whites," irrespective of residence, and as there are very few southern Europeans in the town, the results would only need to be applied in the ratio of the two population groups in the whole district. It is estimated that this ratio is: "All other whites" 4,500 to southern Europeans 3,500 persons.

In order to compare the intensity found in this district with that of other hookworm areas Chandler's (1929) method has been followed. This method has the advantage (especially in areas of generally low infestation) of modifying the effect of a few high atypical counts. The information required is the percentages of persons within arbitrary egg count limits, and from these a graph is constructed using the base-line for percentages and the vertical for egg counts. Vertical lines to meet the graph are then drawn at 10% intervals from 5% to 95% and the sum of the values of these 10 lines divided by 10 gives a number termed the "weighted mean egg count." In lightly infested areas, such as Bengal and Siam, it falls below 10, sometimes below 3, even if the incidence be 8%. In moderately heavily infested areas, such as Mexico and South China, it is between 20 and 40, in Tennessee 10 to 20, while in the heavily infested areas of Porto Rico, Alabama and certain parts of China it goes as high as 40 to 60. Applied to these results the figure for rural southern Europeans is 6; that for the "all other whites" falls below 1.

It is suggested that in estimating the probable effect on the individual these figures be used in conjunction with the classification of Cort and others (1926) which has been compiled from observations on the correlation of hæmoglobin readings and egg counts of Chinese. Counts below 400 eggs per gramme are classed with the "negatives," those with 400 to 2,999 eggs per gramme are regarded as having their blood loss not quite replaced, and may or may not be clinically important; and those above 2,999 eggs per gramme are almost without exception cases of definite hookworm disease. This work was carried out in a district wherein *Ancylostoma duodenale* constituted 60% of the worms recovered following the use of vermifuges.

The amount of hookworm disease in the township judged by this classification is negligible, as only 0·15% would be classed as sufferers and a further 1·5% as border-line cases. Only the southern Europeans from the rural population need consideration, and of these 5% are sufferers and 11% in addition are on the border-line. From this it would seem that a moderate amount of the disease is already present; any relaxation of the present methods for its control might bring about a considerable increase of infestation.

Special attention might be paid to those families responsible for such a large proportion of the ova, as these evidently have a much lower sanitary standard than the rest of their group. All these families are recorded as having unsatisfactory methods of home disposal of night-soil and defective privies, two avenues that might be explored by the local health authorities.

It should be added here that the intensity methods of Caldwell and Stoll take up too much time for general use in field work in Australia. Their introduction would add greatly to the cost of each survey, and in few country towns in the infected areas are such conveniences as running water or any system of sewage disposal available in temporary laboratories. It is difficult then to cleanse glassware properly and to dispose of the potentially dangerous diluted fæces and washings. Some method is required for estimating intensities which will be a sufficient approximation to the correct figure and will not be appreciably longer nor less convenient than a diagnostic technique such as that of Willis.

Earlier information on the ratio of the species is given by Sweet (1924), who has collected the results of worm counts for the period 1919-1924 and finds a preponderance of necators in whites and aborigines. No reference is made to the nationality of the whites, but consideration of the districts of these infected persons leads one to believe the sufferers were mainly of British extraction. The old preponderance of necators, brought about by the importation of Pacific Islanders, seems to be giving way to the newer invasion of *Ancylostoma* due to southern Europeans, though the continued use of anthelmintics, more potent against *Necator*, may possibly contribute to this result.

As a result of treatments, Hill (1923-1926) in Porto Rico obtained a reduction of intensity of 92% and again of 98% when dealing with *Necator* infestations, and Docherty (1926) in Ceylon, where necators predominate, found that after one treatment 40% of the infestation remained. In Docherty's series, as in the present one, treatments were issued out and there was no actual supervision of their administration, the villagers' statements being accepted.

Summary.

1. As a result of a survey of the intensity of hookworm infestation in the Ingham district (North Queensland) it was found that the only important group was that of the southern European farming community.

2. In this group the average intensity was 2,830 eggs per gramme, that of males being 3,055 and of females 2,187 eggs per gramme.

3. A general tendency towards higher counts in the later school ages (10-14 years) was shown in both race groups.

4. Recounts following a single treatment showed reductions of ova output of 98% and 46% in cases harbouring respectively *Necator* and *Ancylostoma*. In the same order the reduction of incidence was 95% and 17%.

5. A small percentage of the population delivered a large percentage of the ova. In the rural districts 10% of the southern European group accounted for 47% of the ova, and in the township 5·5% of the individuals yielded 34% of the ova.

6. Judged by the results of fæcal cultures and examinations of the infective larvæ, *Ancylostoma* infestations were present in 95% of southern European hosts, 66% of "all other whites" and 90% of all persons.

Acknowledgement.

Acknowledgement is made of the valuable assistance rendered by Mr. W. H. Reid, of this Institute, and by the members of the field unit of the Hookworm Campaign under Dr. T. R. Pearce.

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A BIOLOGICAL REACTION TO SCATTERED RADIATION.[1]

By DAPHNE GOULSTON, B.Sc. (Sydney),
Sydney.

THE present paper is a continuation of an article describing "A Hypertrophic Response to Radium Irradiation," which was published in this journal on March 21, 1931.

[1] This work was carried out under the control of the Cancer Research Committee of the University of Sydney and with the aid of the Cancer Research and Treatment Fund.

During the course of the previous investigation it was noted that the site of maximum response of the tissue, comprising the chorio-allantoic membrane of the chick embryo, did not coincide with the site receiving maximum radiation from the radium needle. This fact, diagrammatically presented below, forms the basis of the present group of experiments.

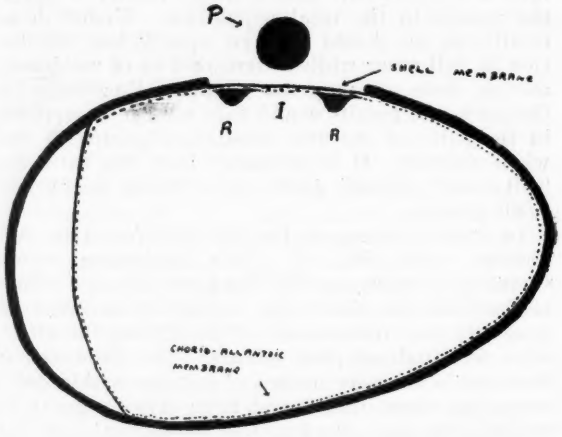

DIAGRAM I.

Diagram of a section of an incubated egg showing the relative positions of P, the source of primary radiation from the radium needle, I, the part of the chorio-allantoic membrane receiving the greatest intensity of radiation from P, and R R the loci of maximum response of the membrane tissue to some stimulating agent.

Employing the same technique as used previously, the relationship of the radium needle to the contour of the shell window was varied according to the site of application of the radium needle, and the size and shape of the shell window. All specimens have been incubated for three days after radiation.

A study of the low power photographs of the results obtained will illustrate the significance of the shell window in the production of the tissue reaction.

Figure I (×5) shows the response of the chorio-allantoic membrane to five hours' radiation with a five milligramme gold-platinum needle placed across the window at NN. The area of the exposed shell membrane was 84 square millimetres. In this specimen two loci of intense hypertrophic reaction are seen.

Figures VIII and IX (×250) are microphotographs of transverse sections taken through the more affected areas, which will be described later.

Figure II (×4) shows a less intense hypertrophic reaction. In this case, using the same needle as employed in specimen shown in Figure IV, the chorio-allantoic membrane was radiated through a shell window of 119 square millimetres area, in the position NN for a period of five and a half hours.

In the specimen exhibited in Figure III (×4), a piece of shell (0·2 millimetre in thickness, 42 square millimetres) was replaced and sealed, by means of wax-vaseline mixture, in the centre of the shell window, to give two exposed shell-membrane surfaces, each area being approximately 31 square millimetres. A three milligramme platinum-radium needle was placed over the shell filter in the position NN for

three hours. This specimen differs from the two preceding ones in that the shell filter prevented any slight stimulation of the tissue between the two main hypertrophies.

Very little tissue reaction is seen in Figure IV (×4), where an area of shell membrane of 156 square millimetres was radiated with a three milligramme platinum needle for three hours. This result offers a great contrast with the experiment depicted in Figure III in that with identical radium needles and the same period of exposure, but a great difference in the amount of exposed shell-membrane surface equidistant from the source of primary radiation, a great difference is seen in the amount of tissue response.

Two experiments were carried out with the intact shell. In (*a*) the chorio-allantoic membrane was radiated through the shell for a period of sixty-five hours with a five milligramme gold-platinum needle; while in (*b*) a three milligramme platinum needle was employed for a period of ninety-six hours. In neither case was there any suggestion of a macroscopical or microscopical tissue reaction. Evidently the particular radiations with the property of producing a biological change are rendered ineffective by 0·2 millimetre of egg shell, which is composed of loosely arranged particles of carbonates and phosphates of calcium and magnesium in an organic matrix; while in the absence of the shell these radiations are able to penetrate through the tough fibrous connective tissue, forming the shell membrane, to be absorbed by some constituents of the chorio-allantoic membrane.

Two more specimens were radiated through narrow shell windows 13 millimetres long and 2·5 millimetres wide. In (*a*) a five milligramme gold-platinum needle was placed lengthways along the slit for five and a half hours, and in (*b*) a four milligramme gold-platinum-radium needle was placed crossways in the centre of the slit for the same period of time. A reaction of the whole of the radiated area of the chorio-allantoic membrane was visible in both cases.

In another experiment where a three milligramme platinum-radium needle was placed across the width of a rectangular shell window of 7·5×17 square millimetres at the extreme edge of the shell for three hours, a pronounced hypertrophic reaction was found only at the site of radiation, the remaining edges of the shell being too far distant from the radium to act as a source of secondary radiation.

When a five milligramme gold-platinum-radium needle was laid lengthways over a shell aperture of 8×15 millimetres for a period of three hours, two distinct lines of hypertrophic tissue were observed macroscopically. These lines of reaction were 5 millimetres apart and 10 millimetres long and were situated one on each side of the locus where the radium needle had previously lain.

A similar result was obtained when the same needle was clothed in bicycle valve rubber tubing of 0·5 to 1·0 millimetre thickness, which eliminates most of β rays from the metals of the needle, and the specimen radiated for four hours. Microphotographs of sections of this specimen appeared in this journal on March 21, 1931, Figures I, II, IV, V and VII.

An extra control was instituted in which a piece of shell was removed from an egg and the shell membrane exposed thus for two and a half hours. The shell was then replaced and sealed and the chorio-allantoic membrane radiated through this replaced shell with a three milligramme needle for four and a half hours. After the usual three days further incubation no microscopical reaction could be observed in the chorio-allantoic membrane.

All the experimental data indicate marked sensitivity of the tissue to some secondary radiation from the edge of the shell window, the area and the intensity of the reaction depending upon the relation of the radium in respect to the edges of the shell window.

The following table is a further illustration of this phenomenon:

	Radium Needle, Milligrammes.	Dosage, Milligramme-Hours.	Area Shell Window, Square Millimetres.	Reaction.
(*a*)	2	8	75	Hypertrophy stimulation.
(*b*)	2	7	30	Atrophy degeneration.
(*c*)	3	18	75	Atrophy degeneration.
(*d*)	3	10·5	92	Hypertrophy stimulation.

Comparison of (*a*) and (*b*) shows the greater intensity in the reaction of tissue radiated through the smaller shell window.

Comparison of (*a*) and (*c*) shows greater intensity in the reaction of tissue with increased dosage of radiation.

Comparison of (*b*) and (*d*) shows decreased intensity of reaction with an increase in the size of the shell window and only a slight increase in dosage.

Research is now being undertaken to further the investigation of these phenomena, and the following is a series of experiments instituted to ascertain the positive or negative effect of scattered radiation from elements of varying atomic weights.

Experiment 1.—A window (area 7·5×4·4 square millimetres) was cut in a piece of lead of 0·4 millimetre thickness and superimposed upon a shell window (area 8·5×11·5 square millimetres) as indicated in the accompanying diagram.

A three milligramme platinum-radium needle was placed lengthways over the lead window for five hours. No response was observed in the chorio-allantoic membrane after the usual three days' further incubation, the absence of a reaction in the region of the lead window indicating that effective radiation was not produced under these conditions. (See Figure V.)

Experiment 2.—When an aluminium window (4·9×8·0 square millimetres × 0·2 millimetre thickness) was substituted for the lead window and the chorio-allantoic membrane radiated with an identical radium needle for the same time (that is, five hours), a strikingly different effect was produced; a macroscopical examination showed a degenerated area at the site of the aluminium window. (See Figure VI.)

Evidently the scattered rays from aluminium are readily absorbed by the tissue membrane, thus giving rise to an intense reaction.

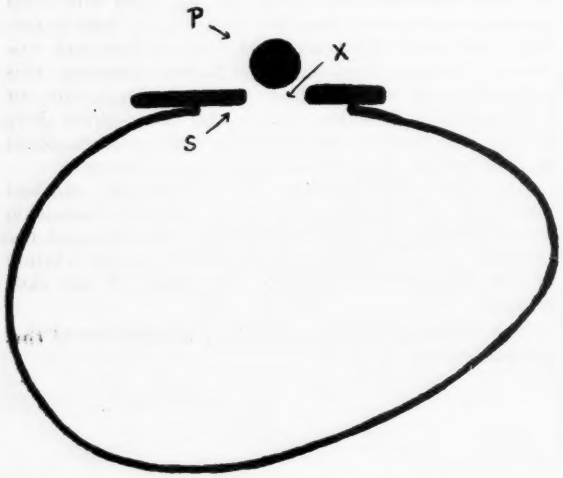

DIAGRAM II.
A diagrammatic section illustrating the positions of P, the radium needle; X, the lead or aluminium window; and S, the shell window.

Experiment 3.—Using a copper window (4·4×8·6 square millimetres × 0·4 millimetre thickness), in place of the metals employed in Experiments 1 and 2, and radiating with identical needle for the same period of time, a small hypertrophic reaction in the vicinity of the copper window was obtained.

Experiment 4.—The edge of a shell window (7×13·5 square millimetres) was coated with a mixture of wax and vaseline which was warmed and applied with a brush to form a wax window inside the cut shell window of 4×10·5 square millimetres area. A three milligramme platinum-radium needle was placed lengthways for three hours. The maximum response of the tissue was found in the centre of the wax window. It would appear from this result that the light elements composing the wax-vaseline mixture are capable of producing scattered rays, which are absorbed by the tissue of the chorio-allantoic membrane. (See Figure VII.)

Conclusion.

While there are probably numerous factors concerned in the biological reactions described in this paper, neither the direct γ radiation from the radium needles, nor the β radiations from the metal screens of the needles, can be regarded as the sole effective agents.

The data suggest that phenomena are due to radiations, or β rays scattered from the bounding surface of the shell round the orifice, the radium needles being the primary source of radiation. The concentration effects seem to be due to maxima of scattered radiation over certain areas according to the configuration of the bounding edges and the position of the needle.

Pronounced effects were obtained with scattered radiations from windows composed of elements of low atomic number such as calcium (20) and aluminium (13), while a lesser effect was obtained with copper (29) and negative results were found with lead (82).

An increased dosage of the "effective" radiation produced an atrophic reaction in the chorio-allantoic membrane.

Hypertrophic and Atrophic Responses to Radium Irradiation.

Some microphotographs are appended of specimens which exhibit a more intense biological response to radium irradiation than those described in a previous communication.

Figures VIII and IX (×250) are microphotographs through the centre of one of the reactions observed in Figure IV, showing hypertrophy of the ectoderm, mesoderm and endoderm with infiltration of the mesenchyme tissue. Some of the cells of the proliferated ectoderm, on the outer edge along the shell membrane have degenerated. The endoderm cells have been stimulated to form a tree-like papilla, many cells of which show signs of deterioration. As mentioned previously, this specimen was radiated with a five milligramme gold-platinum-radium needle for five hours.

Figure X (×5) is a photograph of the response of the chorio-allantoic membrane to a three milligramme platinum needle placed in the direction NN for six hours. (Window, 6·5×11·5 square millimetres.)

The tissue has atrophied at (a) and (a), the sites of the most intense reaction to the radiation. The atrophied areas are surrounded and separated by hypertrophied membrane.

Figures XI, XII and XIII (×250) are microphotographs of sections of the above specimen. Figures XI and XII show the continuation of the atrophic area with the hypertrophic tissue which surrounds this area.

Figure XIII shows a microphotograph of a section through the atrophic area. Only a thin endodermal and ectodermal layer of cells is seen lining the shell membrane.

In Figure XIV (×250) great proliferation of the endodermal cells is seen at the edge of the atrophic area. Most of these cells have become degenerate. As the area of atrophy is approached the mesenchyme tissue is reduced to a minimum and the ectodermal layer has ceased to exist.

Figure XV (oil immersion) is a microphotograph exhibiting a cell undergoing mitosis. This specimen received five and a half hours, radiation with a five milligramme gold-platinum needle.

In these microphotographs, S = shell membrane, E = ectodermal layer of epithelium, M = mesenchyme, N = endodermal layer of epithelium, P = papilla, A = atrophy of membrane.

Acknowledgements.

I wish to express to Dr. H. G. Chapman and Professor Vonwiller my appreciation of their interest and criticism given during the progress of this research. I am also indebted to the Anatomy Department for the sectioning and staining of the specimens and for photographs I to VII.

ILLUSTRATIONS TO THE ARTICLE BY DAPHNE GOULSTON.

FIGURE I.

FIGURE III.

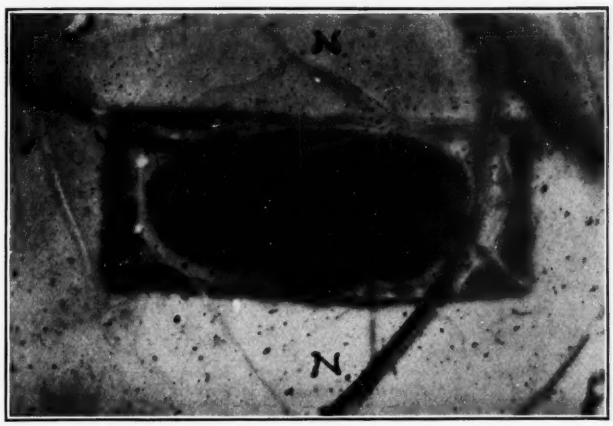

FIGURE II.

FIGURE IV.

ILLUSTRATIONS TO THE ARTICLE BY DAPHNE GOULSTON.

FIGURE V.

FIGURE VII.

FIGURE VI.

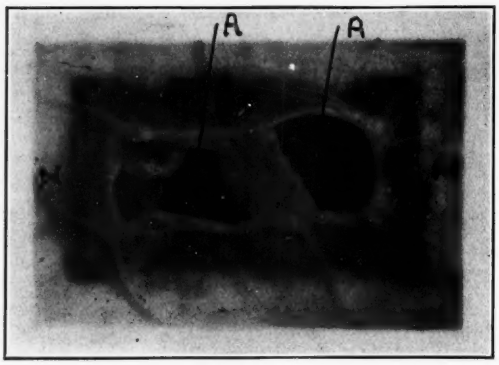

FIGURE X.

ILLUSTRATIONS TO THE ARTICLE BY DAPHNE GOULSTON.

FIGURE VIII.

ILLUSTRATIONS TO THE ARTICLE BY DAPHNE GOULSTON.

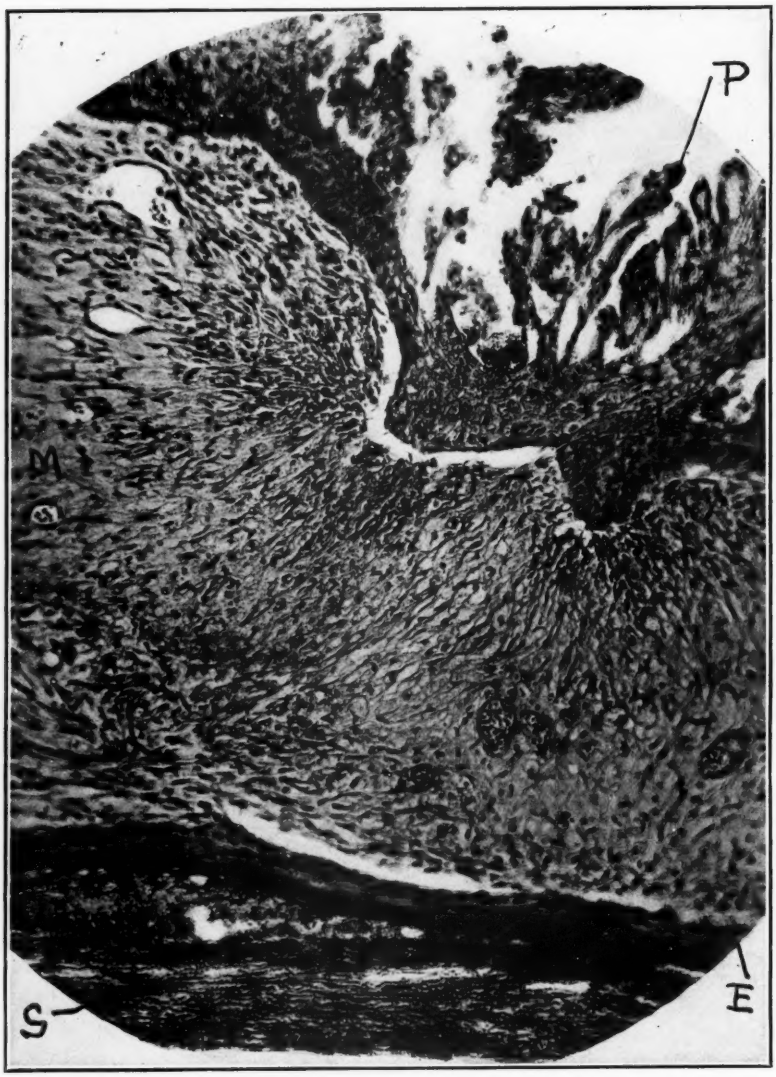

FIGURE IX.

ILLUSTRATIONS TO THE ARTICLE BY DAPHNE GOULSTON.

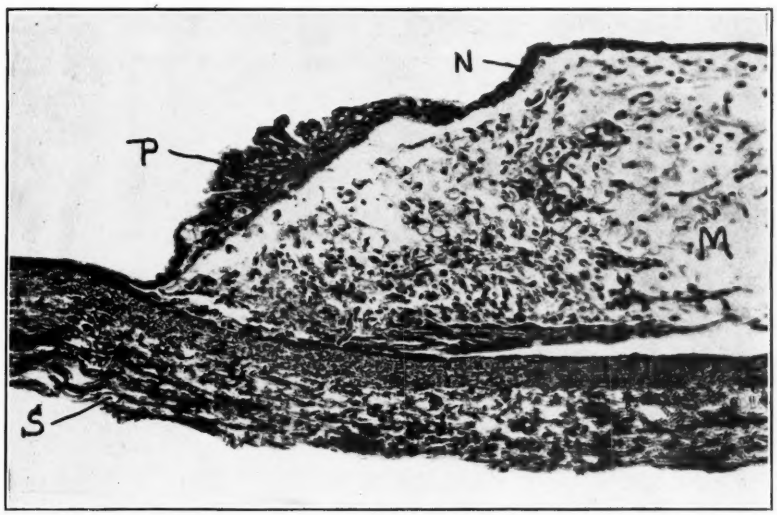

FIGURE XI.

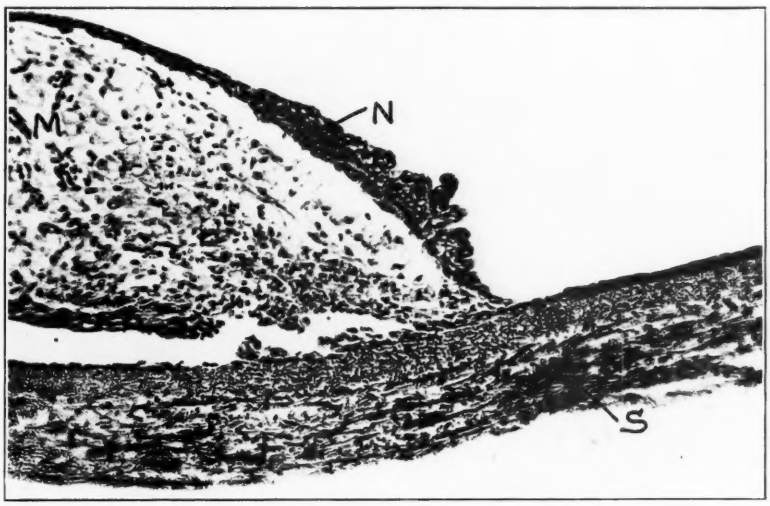

FIGURE XII.

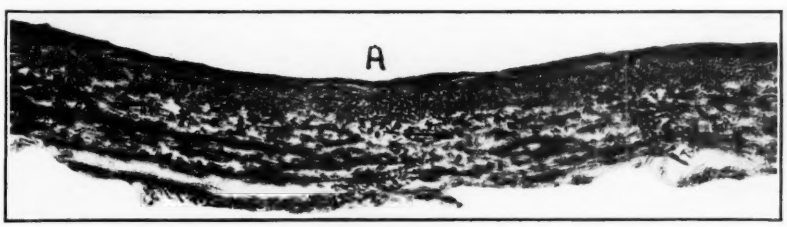

FIGURE XIII.

ILLUSTRATIONS TO THE ARTICLE BY DAPHNE GOULSTON.

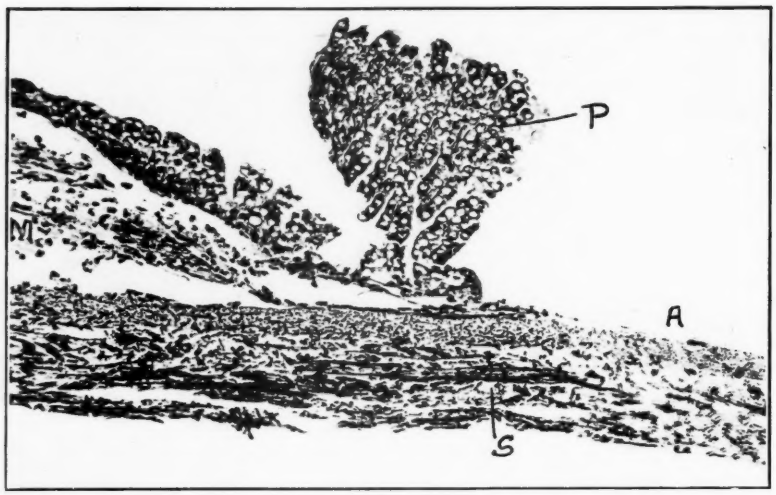

FIGURE XIV.

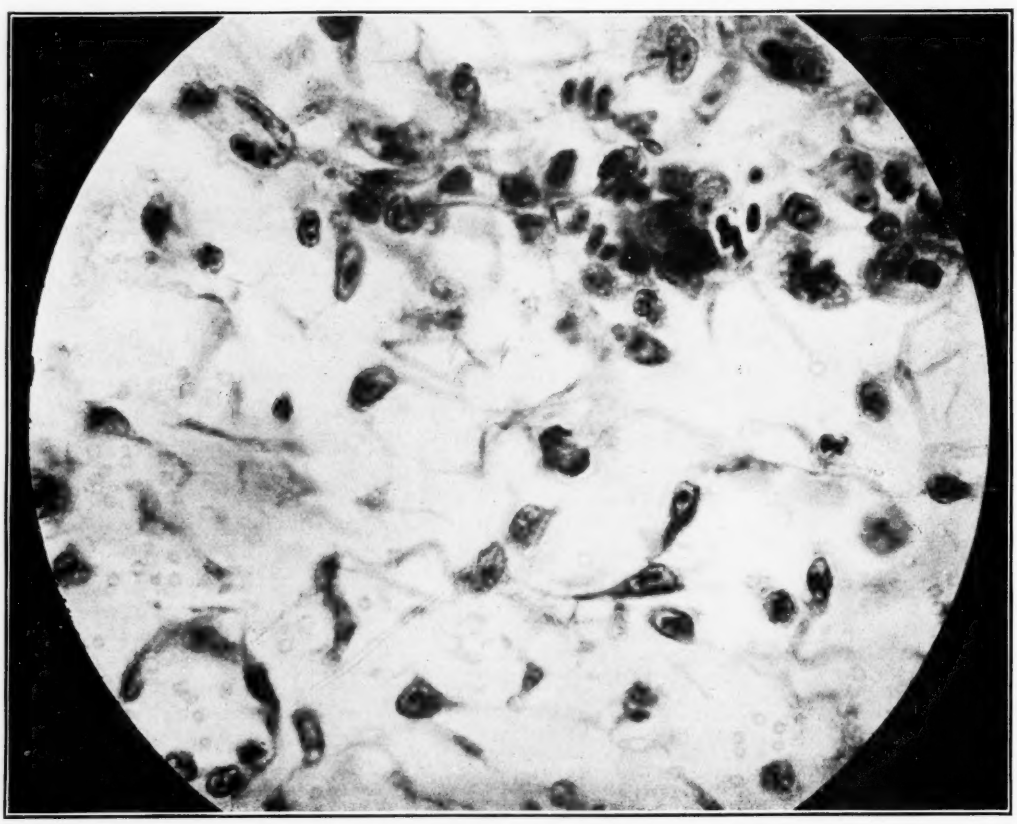

FIGURE XV.

RADIOLOGY IN DIAGNOSIS.[1]

By H. A. McCOY, M.B., Ch.M. (Sydney), D.M.R.E. (Cambridge).

IT is contended by some that the invasion of clinical medicine and surgery by many mechanical and scientific aids to diagnosis is not an unmixed blessing to medical science, and few would refute the imputation that such aids may frequently lead to erroneous conclusions were they not carefully balanced and considered in close conjunction with the clinical picture in every case.

We may claim that clinical diagnosis had developed into a reliable art before any attempt was made to introduce any scientific aids, and the process of infusing that art with mechanical adjuncts has been so gradual as to allow of a fairly complete separation of the chaff from the grain. Any new device calculated to introduce a short cut to diagnosis is viewed with suspicion by members of our profession, and final acceptance of new ideas is arrived at only after careful investigation of their practical worth.

The progress of radiology in this connexion has been so rapid that it behoves us to halt frequently for the purpose of surveying its stage of development. Such an opportunity as this meeting affords those of us who practise this specialty, an opportunity of learning from our colleagues instances of our shortcomings and of discussing with them possible ways of eliminating some, at any rate, of our erroneous conclusions. It is only in such a way that we can hope to enhance the value of our specialty to the profession.

The first duty of the radiologist is, of course, to equip himself with sufficient technical knowledge to enable him to perform the various examinations required of him, and thereafter his success or failure in the interpretation of his work will be judged by his colleagues.

Gastro-Intestinal Tract.

Probably no X ray examination permits of more interesting investigation than the examination of the gastro-intestinal tract. The arbitrary division of the tract into œsophagus, stomach, small and large intestines, though a convenient means of limiting the scope of investigations, may prove a dangerous provision when one section only is selected for examination. How often do the symptoms referable to carcinoma of the œsophagus simulate those of carcinoma of the stomach? If, then, in such a case the investigation is limited to the stomach, it is easily possible to miss a cancer of the œsophagus situated perhaps in the middle of the thorax. Similarly, a spasm at the lower end of the œsophagus with obstruction may prompt an examination of that section alone, whereas further investigations may reveal a huge filling defect in the cardia due to a large carcinoma in that region. The spasm in this case would be a secondary feature which would mask the true nature of the condition. Similarly, pyloric spasm is frequently associated with duodenal ulcer and, if it persists, direct evidence of the ulcer may be difficult to elicit owing to inability to fill the duodenal cap. In some such cases a psychic factor would appear to aggravate the spasm, as at a second examination some hours later, when the patient is less apprehensive, the spasm may have completely disappeared and the true nature of the condition becomes more easily demonstrable.

It is apparently an alteration in muscle tone amounting almost to a spasm which produces that deformity known as "cascade" or "cup and spill" type of stomach. This is apparently a purely functional deformity and is common in the hypersthenic type of individual. It may be mistaken for evidence of an organic lesion in the stomach.

Spasm in the sigmoid during administration of a barium enema may so effectively arrest the passage of the opaque medium into the proximal portion of the colon that a neoplasm may be missed merely because that portion of the colon has not been examined. Spasm, then, is a factor which may prompt erroneous conclusions, and its elimination, if possible, is of paramount importance. Reexamination on another occasion, perhaps after the administration of antispasmodic drugs, may be all that is necessary to disclose an underlying cause.

On the grounds, therefore, that examination of portion only of the gastro-intestinal tract may provide misleading evidence, it seems justifiable to enter a plea for more searching investigations in every case in which positive signs of an organic lesion are not forthcoming.

Observations on the Progress and Healing of Lesions.

The alteration in radiological signs observed during the healing of a simple lesion are often instructive and in this connexion it was interesting to observe the disappearance of a spasm in the œsophagus which was the only X ray evidence of an injury caused by the passage of a fish bone through it.

A more dramatic observation was the complete healing of a chronic penetrating ulcer of the posterior surface of the body of the stomach. Originally the barium filled crater of the ulcer appeared as a fleck about one centimetre in diameter, and after about nine weeks of medical treatment no crater was demonstrable nor was there any other X ray evidence of a lesion.

The X ray appearances of a viscus after operative procedure are sometimes difficult of interpretation, as, for example, the outline of a stomach after partial gastrectomy. It is frequently impossible to be even reasonably certain that such appearances do not indicate a recurrence. The shortcomings of such investigations should therefore be kept in mind.

Incorrect Interpretation.

Although it seems certain that many incorrect radiological opinions are due to the fact that the investigator sees too much in the shadows before

[1] Read at a meeting of the South Australian Branch of the British Medical Association on April 30, 1931.

him, yet it is almost as certain that as many mistaken interpretations are directly attributable to the fact that the investigator has deliberately discounted, for some reason, strong positive evidence of a lesion.

For example, one recalls performing a barium meal examination in the case of a woman who complained of digestive symptoms.

The patient was an unusually nervous subject and she complained at the necessity of drinking the barium emulsion. It was only after considerable reassurance that she was persuaded to drink about four ounces of the meal. This was quite inadequate to fill the stomach and owing to unusual patency of the pylorus the stomach emptied fairly rapidly. It did not seem possible, therefore, to fill the stomach, and a contracted appearance of the cardia was interpreted as being due merely to lack of mechanical distension. After an interval of several months the gastric symptoms became aggravated and a large mass was palpable in the epigastrium descending apparently from the left hypochondrium.

Although no operation has been performed there seems no doubt that faulty radiological interpretation was responsible for failure to detect a new growth originating in the cardia of the stomach.

A common example of the reverse form of incorrect interpretation is met with in the irregularity of the greater curvature resulting from pressure by the splenic flexure and adjacent structures. This may be mistaken for a filling defect of a neoplasm in this position. The difficulties of finally differentiating a lesion from a pressure defect cannot be overestimated. Reexamination after the administration of an evacuant enema may disclose an alteration in apearances which will eliminate the possibility of new growth, but in spite of careful investigation and efficient preparation, incorrect radiological interpretation is encountered more frequently in this than in any other portion of the stomach.

In the ordinary J-shaped stomach the duodenojejunal flexure lies immediately behind the centre of the lesser curvature of the stomach. The shadow of the flexure, which may contain barium throughout the examination, appears frequently as a projection on the lesser curvature and may be incorrectly interpreted therefore as the barium filled crater of an ulcer on the lesser curvature. Satisfactory visualization of the stomach on the fluorescent screen combined with palpation should differentiate the condition and radiographs of the stomach in an oblique position will disclose the true relation of the flexure to the posterior surface of the stomach. If, however, reliance is placed on appearances seen in radiographs taken in the anteroposterior position alone, the misinterpretation will not be infrequent.

Such, then, are some few of the many possible sources of error in the radiological investigation of the gastro-intestinal tract.

Biliary Tract.

The use of an opaque medium for examination of the gall bladder has been universally adopted and examinations vary only in the manner in which the opaque material is administered and the form in which it is given. The oral method of administration has as a strong recommendation its simplicity, and many of the objections to its use have been deleted as a result of improved methods of administration.

Cases of biliary tract investigation in which either positive shadows of gall stones are seen or negative shadows of gall stones are demonstrated after the administration of an opaque salt, form probably the minority of cases examined by radiologists. The majority includes a few in which the gall bladder appears to function normally and no evidence of a lesion is forthcoming, but many more in which an unsatisfactory shadow of the gall bladder is obtainable. This may vary from a faint shadow of opaque material to a total absence of any shadow, and the correct interpretation of this variety of appearances is a matter of considerable difficulty. Provided there is uniformity of technique both in the preparation of the patient and in the making of the radiographs, the possession of negative evidence should be, theoretically speaking, of considerable value. In practice it appears, however, that a poor quality of shadow is insufficient evidence on which to base a diagnosis of pathological gall bladder in every case.

Urinary Tract.

Pyelography provides for the urologist a useful adjunct to his diagnostic investigations and radiographic exposures combined with a full cystoscopic investigation (including catheterization of the ureters) constitutes a *modus operandi* which seems justifiable in every case in which there are symptoms referable to the urinary tract.

Injection of the kidney pelvis with radio-opaque fluid is frequently the means of demonstrating a pathological condition of the kidney not easily demonstrable by other means. In this way alteration in size of the calyces, tumour in the kidney pelvis, radiotranslucent calculi are some of the more common conditions which are so demonstrated. Excretion urography should prove to be a valuable aid in the future.

The shadows in the abdomen which may resemble those cast by urinary calculi are numerous and the differentiation is not always simple. In the kidney areas shadows due to calcified mesenteric glands may be, as a rule, distinguished from those due to calculi; by reason of the fact that the former do not necessarily retain a constant relation to the kidney outline during respiratory movement, the latter must of necessity retain such a relation.

In addition there is, of course, the usual difference in appearance of shadows cast by calcified glands and those due to calculi, but differentiation on this score is not always certain.

Phleboliths in the pelvis may cast shadows closely resembling ureteral or vesical calculi and their differentiation is not always certain, even when stereoscopic radiographs are taken with opaque catheters in the ureters.

Calcification within the uterine appendages, stercoliths, calcification in the walls of blood vessels

and in the sacral ligaments comprise other conditions which may give rise to conflicting radiographic appearances.

The interpretation of shadows which we recognize in radiological examinations is beset, therefore, with numerous difficulties, but the partial solution of some, at any rate, of our problems must rely on a close cooperation between the clinician, the pathologist and the radiologist.

Reports of Cases.

AN X RAY FILM PROJECTOR: A PRELIMINARY REPORT.[1]

By H. CAREW NOTT, M.B., B.S. (Adelaide), D.M.R.E. (Cantab.),
Honorary Radiologist, Adelaide Hospital; Lecturer in Radiology, University of Adelaide.

THE apparatus, photographs of which are attached, is designed to project an image of original X ray negatives.

The demonstration of X ray negatives to an audience with the use of an ordinary viewing box is most unsatisfactory, especially where (as happens in most cases) fine detail and slight alterations in density are the important points to observe. Under present circumstances the only alternative is to project the picture in the form of a lantern slide.

Now a lantern slide of an X ray negative has two very definite disadvantages: (i) time and cost of production, (ii) unavoidable loss of some detail and increase in contrast, in both of which a lantern slide often loses all diagnostic value.

It was to obviate both these disadvantages that the idea of the present projector, in which an image of the original X ray negative is projected, was conceived. The apparatus consists essentially of: (i) illuminating box, (ii) film holder, (iii) camera, (iv) lens.

It is designed to enlarge three times (linear) at a distance of twenty-five feet, but an enlargement of four times at that distance would be an advantage if enough illumination could be arranged.

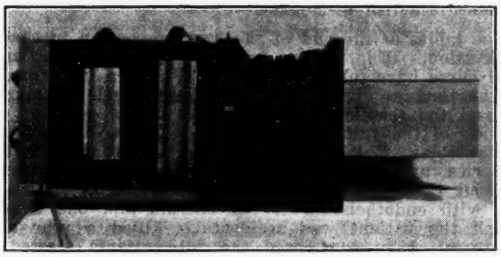

FIGURE I.
Showing X ray projection assembled.

In regard to the illuminating box, it should be noted that an illumination is required at least nine times as strong as that necessary to view a fairly dense film in the ordinary way in a viewing box.

The largest X ray films measure seventeen inches by fourteen inches, but the present apparatus was made to take as largest the next size, fifteen inches by twelve inches; the completed apparatus should be made to take the largest size, that is, seventeen inches either vertically or horizontally; however, it may be practicable only to make allowance for a field fifteen inches by fifteen inches on account of the lighting difficulties.

[1] Read at a meeting of the South Australian Branch of the British Medical Association on April 30, 1931.

The illumination provided was by five lamps, totalling 2,150 candle-power; this entailed the production of so much heat that the film holder became hot enough to melt the films until a cooling chamber was made by dividing the illuminating box into two compartments by the interposition of a sheet of ground glass. With this arrangement the heat produced seems to be too much for thoroughly satisfactory working, and the illumination provided is still too little in spite of the high candle-power. Therefore, it seems that some form of condenser will have to be devised, for example, a water or clear oil condenser, unless a large glass condenser can be manufactured at a reasonable price. Or it might be possible to get the required illumination with a strong arc and a large parabolic reflector, the direct rays from the arc being shielded from the films to obviate the central point of light in the image.

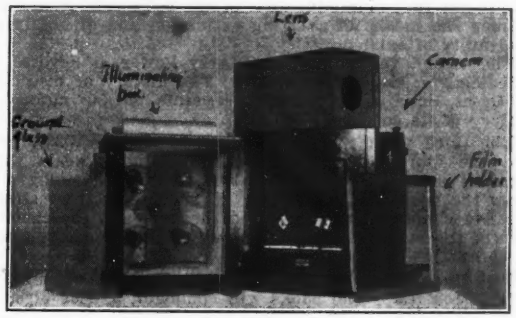

FIGURE II.
Showing parts of X ray projector.

The film holder and camera are mechanical devices which are easily adjusted to circumstances and raise no difficulties whatever.

In regard to the lens, a combination is required which will enlarge the object three to four times (linear) at a distance of about twenty to twenty-five feet.

No lens could be procured with this qualification, so Professor Kerr Grant, of the Adelaide University, very kindly devised a combination of a double concave and a double convex lens which served the purpose very well; but various corrections would have to be provided in the finished article.

A necessary adjunct would be an iris diaphragm in front of the lens for stopping down the illumination with thin negatives.

Acknowledgement.

In conclusion, I wish to express my thanks to the manager and staff of Kodak, Limited (South Australian branch) for the time and money expended in constructing this experimental apparatus, and to Professor Kerr Grant for his help and loan of lenses.

Reviews.

HANDBOOKS ON MEDICAL HISTORY.

UNDER the general title "Clio Medica" have been published the first five of a series of hand books on medical history.[1] The editor, Dr. E. B. Krumbhaar, states in the preface that the object is to present "in a concise and readable form a number of special phases of the long and complex history that underlies the great edifice of modern medical science." During recent years considerable

[1] "Clio Medica": A Series of Primers on the History of Medicine, Edited by E. B. Krumbhaar, M.D.; 1930. I—The Beginnings: Egypt and Assyria, by W. R. Dawson, F.R.S.E. II—Medicine in the British Isles, by Sir D'Arcy Power, K.B.E., F.R.C.S.E. III—Anatomy, by G. W. Corner, M.D. IV—Internal Medicine, by Sir H. Rolleston, Bart. V—Physiology, by J. F. Fulton, M.D. New York: Paul B. Hoeber. Crown 8vo., with illustrations. Price: $1.50 each.

attention has been paid to medical history. Many books have been published and many historical articles have appeared in medical journals. The books are generally bulky and the journal articles necessarily scattered and devoted to isolated subjects. There is a need for a series such as that under review. The volumes are small enough to be carried in the coat pocket and the type is sufficiently large and clear.

In the first volume W. R. Dawson, the author of "Magician and Leech," deals with "The Beginnings—Egypt and Assyria." He shows that embalming the dead body had a definite relation to the growth of medical science. Not only did it familiarize its users with much of the internal structure of the body and with the preservative properties of the salts and resins employed in the process, but it was an important means by which the prejudice against cutting the human body was overcome and which made systematic dissection possible. The author also points out that mummification of the body seemed to offer to men the means of averting extinction and of obtaining continuity of existence.

The second volume, by Sir D'Arcy Power, is devoted to "Medicine in the British Isles." The history of medicine in Great Britain, as the author points out, is mainly a history of its corporate bodies.

The third volume, "Anatomy," is by George W. Corner, and the fourth, by Sir Humphry Rolleston, deals with internal medicine. The fifth volume, on physiology, is from the pen of J. F. Fulton. This is most interesting; the five chapters are devoted to the ancients, the circulation of the blood, respiration, digestion and the physiology of the nineteenth century.

The illustrations in these books are good, but perhaps a trifle too few. The books will command a wide circulation, for many of the subjects are discussed from a new point of view; the writing is good, much of it is quite charming. We look forward to the appearance of the other volumes of the series.

DIET AND SURGICAL PRACTICE.

IN his little book entitled "Diet and Care of the Surgical Case" Dr. R. H. Boyd has succeeded in producing a useful work of reference on an important subject.[1]

The preface gives the aim and ambition of the author, which is to supply in a handy form information culled from many reliable sources. Not the least of these sources is the experience Dr. Boyd has had in his capacity of house surgeon to prominent surgical specialists. He has taken note of their various methods and now presents them in book form. The work, if not exhaustive, is sound as far as it goes, and students and young practitioners will doubtless find it of service in some of their dilemmas.

The latter part of the mook is devoted to notes on the operative care and dieting of children, and should prove useful to those whom it may concern. There is an introduction by Mr. C. C. Choyce.

THE TONGUE AND ITS DISEASES.

THE use of radium in the treatment of malignant conditions of the mouth is in itself sufficient reason for a new edition of what was a standard British work on diseases of the tongue. Spencer and Cade, in "Diseases of the Tongue,"[2] describe the volume as the third edition of Butlin's book, which was first published in 1885 and which has not been revised since 1900. Nearly half the book is devoted to carcinoma of the tongue and mouth, and the impression is left that a more useful purpose would have been served if the authors had published a monograph on their experiences in radium treatment of these malignant conditions and had later revised the rest of Butlin's work in the light of the increased knowledge of bacteriology *et cetera* which has been acquired during the past thirty years.

The opening chapters on the development, the anatomy and the physiology of the tongue are excellent, as is the section on tuberculous ulceration. The technique of radium treatment given in Chapter XVI is clearly explained and a comprehensive bibliography at the end of each chapter enhances the value of the book for reference purposes.

Stress is laid on the seriousness of oral sepsis, not only because of its deleterious effects on other organs, but also because its presence precludes safe operative treatment. The authors' experiences with radium needles have shown them that it is essential to get rid of all infective material in the mouth before needling a growth, the necessity for removing all metal fillings and the advisability of removing, if possible, all teeth. As they point out, the loss of the teeth is a small price to pay for the chance of cure. Removal of the teeth followed by local antiseptic measures removes the sources of infection, prevents secondary radiations and provides better access for the surgeon.

It is obvious that much work has been done, especially by Mr. Cade, in the endeavour to improve the lot of those afflicted with cancer of the mouth, and to him and to others in various parts of the world we owe a debt of gratitude. His conclusions as to the best method may be summarized by stating that the treatment of the primary lesion should be by radium, that needles are preferable to seeds, that reneedling after seven days is better than the practice of inserting larger doses of radium for a shorter time, and that protection of the rest of the mouth is essential to avoid necrosis and ulceration. In treating the glandular area, needling is recommended when the glands are not palpable, block dissection (not followed by insertion of radium) for glands which are palpable but removable, and needling for fixed inoperable glands.

It is regrettable that the literary style of the authors betrays evidence of carelessness. On pages 349 and 351 the term "exciting cause" is used in different senses. On page 352 the following curious sentence appears: "The influence of syphilis, although latent, in the lesions just mentioned, when irritated may at a later period become cancerous ulcers"; and there are other sentences of the same type. The word "unpalpable" does not appear in a standard English dictionary.

The tables at the end of the book convey an inaccurate impression. It is not yet justifiable to assert that many final cures have followed the use of radium in carcinoma of the tongue. If the cases reported could be followed up and the results given five years hence, a better conception of the value of radium as a curative agent may be possible. We have carefully read through the case histories and, after excluding twelve patients treated without radium, two patients with carcinoma of the lip, one with endothelioma of the antrum and one case in which the patient was accidentally killed a year after treatment, have considered the 201 patients treated by radium alone or by radium in conjunction with excision and diathermy. No fewer than 16 (8%) died during treatment, 14 (7%) failed to respond or became worse, 23 (11·5%) are recorded as "palliated only," 42 (21%) were dead within two years (32 of these dying within one year). Mr. Cade, at the time of writing, had only two patients who had survived a five-year period, and one of those had died soon afterwards. It is wrong to attempt to estimate the value of radium as a curative agent on the results gained within the past two years, and the fifty patients who have improved over that period must be watched for another five years before sound conclusions can be reached. It is useless to point out, as is done in the book, that some patients were "inoperable when first seen," for the same remark applied before radium was used. It is to be hoped that the authors will publish their results in five years' time and that the results then will be more encouraging.

[1] "Diet and Care of the Surgical Case," by R. H. Boyd, M.B., Ch.B., F.R.C.S., with an introduction by C. C. Choyce, C.M.G., C.B.E., F.R.C.S.; 1930. London: H. K. Lewis and Company Limited. Crown 8vo., pp. 116. Price: 5s. net.

[2] "Diseases of the Tongue," by W. G. Spencer, M.S., F.R.C.S. and S. Cade, F.R.C.S., being the Third Edition of Butlin's "Diseases of the Tongue"; 1931. London: H. K. Lewis. Demy 8vo., pp. 577, with 20 coloured plates and 123 illustrations in the text. Price: 35s. net.

The Medical Journal of Australia

SATURDAY, JULY 18, 1931.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction, are invited to seek the advice of the Editor.

HOSPITAL ALMONERS.

If a hospital is defined as an institution at which a patient receives treatment for an illness or a disablement, most people will be satisfied. Their conception, however, will be incomplete, for to them treatment implies merely the prescription of a certain remedy or the performance of a certain operation after a diagnosis has been made. Were man a machine-made product, turned out according to pattern, treatment of this kind would probably suffice. Medical practitioners know and the public is beginning to realize that treatment is barely begun when the diagnosis has been made and when the remedy has been applied or the operation performed. Man has a nervous system and has obligations to meet, obligations which may concern himself alone or which may have to do with one or more dependants. Psychological and economic factors are assuming much larger proportions than ever before; life is so strenuous, so much nervous energy is dissipated, the struggle for mere existence is so keen and the failures are so many that diseases may have many different effects on the individual. Treatment is bound to be ineffective if the psychological and economic factors are ignored. The economic outlook of the individual patient is not the only economic factor to be considered. The hospital at which the treatment is carried out, is altering, or rather has altered in character. The so-called hospital problem is as acute in the Commonwealth of Australia as in any other part of the world. Public hospitals are no longer eleemosynary institutions. Government grants are made to hospitals and in some places taxation is levied expressly for their support. They are no longer reserved for the poor and destitute. Persons who are unable to pay are admitted and treated as in the past, but those who can are expected to pay small amounts. The medical profession gives its services freely and willingly to those who cannot pay, and in some places contributions are made by paying patients to a staff fund expended in a manner determined by the staff.

It is clear that the complete treatment of patients cannot be supervised by the medical attendant in ward or out-patient department. He cannot investigate the home surroundings of each patient, he cannot discover the hundred and one worries, anxieties and adversities that add complexity to the disease picture or that help to delay recovery. Neither can the hospital authorities take all the precautions necessary to prevent imposition by the unscrupulous. In Great Britain an attempt has been made to fill in the gaps and surmount the difficulties by the appointment of hospital almoners. Some years later America adopted the same expedient under the more appropriate title of hospital service. (The giving of alms has little to do with the work.) In both countries the results have been satisfactory. A year or two ago the work of The Institute of Hospital Almoners of Great Britain was extended to Melbourne. An almoner was appointed at the Melbourne Hospital and in a recent report to the Melbourne Hospital Committee the Medical Superintendent comments favourably on the work and recommends the appointment of additional almoners. It is not necessary to enumerate the many activities of a hospital almoner. They have been discussed in these pages on previous occasions. Those who wish to gain detailed information on recent observations are referred to a brochure written by Dr. J. Newman

Morris and issued recently by the Victorian Institute of Almoners.

In any discussion on the appointment of almoners to public hospitals emphasis should be laid on the benefits likely to be gained by the patient from such a practice. By the aid of a trained almoner the patient will enjoy to the full what medical science, and particularly the preventive side of medical science, has to give him. The almoner will be the means of bringing complex ætiological factors to the notice of the hospital medical officer, of smoothing out the complexities and of seeing that treatment instituted in the hospital is carried to its logical conclusion in the home by helping the patient to help himself. At the same time there is another reason why the hospital authorities should give serious attention to the question of training and installing almoners. There is evidence at present of a desire on the part of many people to get something for nothing when they have something that might well be given in return. Every hospital secretary and every hospital superintendent knows that deliberate deception is practised and that the only result as far as the hospital is concerned is an addition to the overdraft at the bank. It is said that there is a secret antagonism to the appointment of almoners on the part of hospital officers. This may or may not be true. Perhaps hospital boards and committees may be made to see that the appointment of hospital almoners would react favourably on hospital banking accounts. If they could be so persuaded, the more important advantages in regard to diagnosis and treatment would be gained.

Current Comment.

STREPTOCOCCAL INFECTIONS.

THE streptococcus has long been regarded as potentially one of the most dangerous of the bacteria, but only within recent years has the influence of species and type been appreciated. It is now known that only streptococci of certain species or types are dangerous to man; increased virulence, from whatever cause, though an important factor, is by no means the only one affecting the pathogenicity of the microorganism and the severity of the disease it produces. Also within recent years, by the aid of improved bacteriological technique and increased bacteriological knowledge, investigators have found that streptococcal septicæmia occurs with considerably greater frequenecy than was previously supposed; streptococci have been proved to be the cause of some conditions in which their influence was formerly only suspected.

In the *Guy's Hospital Reports* for April, 1930, there appeared a symposium on staphylococcal infections; this was commented on in the issue of this journal for August 30, 1930. A symposium on streptococcal infections now appears.[1] Of the papers contained in this symposium the most useful is that of John A. Ryle and R. E. Smith, concerning "The Natural History, Prognosis and Treatment of Streptococcal Fever." Ryle and Smith divide streptococcal fever into the types "bacteriæmia" and "septicæmia"; in the one case the organisms are merely incidentally present in the blood stream, and in the other they flourish and multiply there. Ryle and Smith point out the difficulties of laboratory diagnosis; for example, a septicæmia may exist though repeated attempts at culturing organisms from the blood prove fruitless; the medical practitioner must be guided by his clinical judgement in such circumstances and also in deciding whether a condition is due to bacteriæmia or septicæmia in the event of the successful cultivation of streptococci from the blood. The paths of invasion of streptococcal infection are many and varied; such a trivial wound as a pin prick or a mosquito bite may provide the portal of entry. Medical practitioners especially are liable to infection through wounds, however slight, of the hands; doubtless the recent passage of the bacteria through one or more hosts often results in the increased virulence of the medical practitioner's infection. The lymphatic system acts as a defensive mechanism against streptococcal invasion, but in certain fulminating infections the bacteria seem to pass directly into the blood stream. The outstanding features of streptococcal fever are much the same as those of any septicæmia, but Ryle and Smith mention four manifestations which they regard as diagnostic of fever due to streptococci of a hæmolytic strain: diarrhœa; the presence of albumin, red blood cells and casts in the urine, which is occasionally smoky; rapidly progressive anæmia; smoothness, redness, desquamation and soreness of the tongue. The spleen becomes enlarged, sometimes considerably, but is often so soft that it cannot be palpated. Ryle and Smith discuss the great variety of symptoms which may occur, and quote a number of interesting cases. Death from streptococcal fever usually occurs within the first fortnight of the illness. If the patient is able to withstand the onslaught of the infection for two weeks, he has a fair prospect of recovery. Additional favourable features are a surgically accessible point of invasion, a high leucocytosis and localization of the infection in situations where it is amenable to surgical treatment. According to Ryle and Smith,

[1] *Guy's Hospital Reports*, January, 1931.

treatment should be along general lines; the intravenous administration of antiseptic solutions should be avoided, as there is no evidence of its value, and some antiseptics have toxic effects; the administration of antistreptococcal serum is also of doubtful efficacy; it is very generally employed, and if the results of its use were at all dramatic there would surely be a more general agreement as to its value. It should be noted that scarlet fever and erysipelas, which are actually streptococcal fevers, are purposely not given consideration in this paper.

Streptococcal puerperal sepsis is dealt with by C. F. Gibberd in a full and interesting paper. In the years prior to the European War, in seeking for the source of streptococci causing puerperal fever, German and American investigators were considerably at variance in their views. American observers declared that streptococci were seldom found in the vaginæ of healthy women prior to labour; German observers held an opposite opinion. At this time the differences in virulence and types of streptococci were not appreciated by most, but it is of interest to note the suggestion made by Williams that the results of investigation in the two countries differed because Americans washed more than Germans—possibly an adequate explanation. The results of more recent investigations indicate that the occurrence of pathogenic streptococci in the vagina during pregnancy is a rarity. Gibberd points out that it is extremely difficult to ascertain the usual source of streptococcal puerperal infection. The condition of the vulva and perineum should not be forgotten; though it is admitted that the sterilization of the skin is well nigh impossible, cleansing of vulva and perineum with weak solutions of antiseptics should not be discarded. Infection from bed pans and dressings after the conclusion of labour is a possibility which should not be overlooked. Some observers are of the opinion that the throats of attendants are the chief source of infection; Gibberd remarks that infected tonsils undoubtedly may be a source; he therefore urges that the medical attendant should wear a face mask while attending a woman in labour. In March, 1928, Marshall Allan and Bryce reported in this journal an outbreak of puerperal infection which was traced to a nurse with a naso-pharyngeal infection.

Investigations have been made into the value of the Dick test as a test of susceptibility to streptococcal puerperal fever; though there is some difference of opinion on the matter, it would seem that little information of value can be gained by the application of this test. Important factors in increasing susceptibility to infection are fatigue and anæmia. Thus it is necessary immediately to make up by transfusion any great loss of blood incurred during or after labour. Gibberd mentions local resistance of the tissues of the parturient canal. Lowered local resistance is undoubtedly a factor in many instances and its failure to prevent streptococcal invasion is a demonstration of the phenomenon of kataphylaxia discussed in these pages on June 28, 1930. For the local treatment of puerperal sepsis Gibberd recommends drainage and decries methods entailing curettage and the intrauterine application of antiseptics; he is in doubt concerning the value of the intrauterine instillation of glycerine recommended by Remmington Hobbs, but he remarks that Hobbs's technique is a distinct advance on methods formerly employed. Gibberd has seen no good result from the intravenous administration of antiseptic solutions nor from the use of antistreptococcal serum, which he condemns also on two other counts, namely, it is a "blunderbuss" preparation and its dosage in antibodies is uncertain. He admits the value of the administration of antiscarlatinal serum when the infection is confined to the parturient canal. Blood transfusion is a valuable therapeutic measure, but may be dangerous when the disease is well established, and should be employed only when the patient is in a fit condition to withstand the inevitable reaction.

The streptococci, their habitat, their types and their significance in medicine are discussed by F. A. Knott in an admirable paper. W. M. Mollison deals with streptococcal infections of the throat and urges the use of antistreptococcal serum in the treatment of acute inflammation of this region. The subject of hæmolytic streptococci in the mastoid process is handled by T. B. Layton in a paper of more than usual interest. In addition, the skin as affected by streptococcal infections is discussed by H. W. Barber and L. Forman, and a bacteriological study of apical infection of the teeth is contributed by Arthur Bulleid.

All these papers are of value, but it is obviously impossible to give more than passing mention to them. The members of the staff of Guy's Hospital who have contributed to this symposium have earned the gratitude of all medical practitioners.

Unfortunately the practitioner of clinical medicine or surgery has no ready means of ascertaining whether any particular streptococcus is of a virulent strain, therefore all streptococci must be held suspect. On the other hand, the clinical features of streptococcal blood infection are now fairly well defined and should be known to every medical practitioner. A study of these Guy's Hospital papers should be of great assistance, not only in the gaining of such knowledge, but also in allowing a broad view of streptococcal infection in regard to its source, its manifestations in various fields, its prognosis and its treatment. The importance of the subject cannot be too strongly emphasized.

A NEW RENAL EFFICIENCY TEST.

IN the issue of July 4, 1931, an account was given of a new renal efficiency test described by Möller, McIntosh and Van Slyke. Unfortunately an error was made in printing one of the equations. The third equation on page 21 should read:

$$C_s = C \times \sqrt{\frac{1}{V}}$$

Abstracts from Current Medical Literature.

PHYSIOLOGY.

Results of Complete and Partial Extirpation of the Pituitary Gland.

SPONTANEOUS activity was markedly diminished in a series of completely hypophysectomized rats studied by C. P. Richter and G. B. Wislocki (*American Journal of Physiology*, November, 1930). Partial removal of the gland did not affect the activity. Body weight and food intake were usually decreased to a low level at which they remained fairly constant. In the animals in which the gland was completely lacking, the œstrous cycles were absent. If only anterior lobe tissue remained the cycles were normal, but were markedly disturbed in several cases in which remnants of both anterior and posterior lobes were present. Permanent polydipsia occurred in a large proportion of the rats with the pituitary only partially removed, but occurred in only one of ten animals in which total extirpation was performed. The polydipsia is thought to be due to injury to the hypothalamus. Injection of an alkaline extract of the anterior lobe of sheep's pituitary glands produced in animals lacking the hypophysis a definite increase in body weight and food intake. After complete removal of the pituitary *post mortem* examination revealed pronounced hypoplasia of the thyreoid and adrenal glands. The reproductive organs were atrophic. The thymus and lymphatic glands were enlarged and there was a pronounced disappearance of body fat.

Cardiovascular Reactions to Temperature Changes.

A. GROLLMAN (*American Journal of Physiology*, November, 1930) has investigated the effects of temperature changes in the environment upon the lightly clothed subject. The range covered was from 0° C. to 45° C., and in all cases the atmospheric humidity was kept at a low level. As the temperature increases there is a progressive rise in pulse rate, but below room temperature the changes are slight. If basal conditions are observed the systolic blood pressure has variations of only about 10% and the pulse pressure is practically constant. A characteristic variation of systolic blood pressure is from 116 millimetres of mercury at 0° C. to 100 millimetres of mercury at 32° C. The metabolic rate declines with increase of environmental temperature up to 30° C., above which it again rises slowly. The cardiac output remains constant over the range of from 0° C. to 28° C. At temperatures above 28° C. the output gradually increases, giving at 45° C. an average value of 1·3 litres per minute above the value at normal room temperature. It is suggested that the constancy of cardiac output with moderate degrees of cold is analogous to its constancy with slight degrees of muscular activity. The increase at higher temperatures corresponds to the peripheral dilatation which occurs under these conditions. The arterio-venous oxygen difference decreases from 79 cubic centimetres per litre at 0° C. to 46 cubic centimetres at 45° C.

The Absorption of Calcium from the Gall Bladder.

L. MIRVISH, G. SACKS AND T. SCHRIRE (*Journal of Physiology*, December, 1930) have performed analyses of the calcium in the hepatic and cystic bile of a number of animals which were either decerebrate or were kept under anæsthesia during the course of the experiments. After clamping the cystic duct the gall bladder was washed out and a volume of saline solution was then left inside it. Subsequent analysis showed that no calcium was excreted into this saline solution even after the administration of calcium chloride intravenously or into the duodenum. In another set of experiments various fluids were introduced into the gall bladder whose connexion with the hepatic duct had been severed. These fluids were mammalian Ringer's solution containing excess of calcium, cystic bile to which solid calcium chloride had been added, cystic bile, cystic bile diluted with Ringer's solution and hepatic bile previously taken from the same animal. There was definite evidence that from all these fluids calcium was absorbed—most readily from the solution of calcium chloride in Ringer's solution. Intravenous or duodenal administration of calcium produced an increase in the concentration of the metal in the hepatic bile and a more or less parallel increase in the blood calcium content. It is suggested that there is a "calcium cycle" in the liver which represents a mechanism for the continuous supply of calcium to the general circulation in order to maintain a constant concentration of calcium in the blood.

Determinations of Blood Volume in Human Beings with the Vital-Red Method.

IN spite of, or perhaps because of, numerous determinations of blood volume by different methods there is yet no agreement as to its relation to the other physical constants of the body. C. C. Fleischer-Hansen (*Skandinavisches Archiv fur Physiologie*, September, 1930) has described in detail a technique for the application of the vital-red injection method. In order to insure adequate mixing of the dye with the blood the subject must carry out a series of "mixing movements" both before the injection of the dye and before the withdrawal of the blood samples. As a check on the mixing two samples of venous blood are taken from different situations and the concentration of dye in each sample is compared; equality indicates satisfactory mixing. Five minutes after the injection of the dye is a satisfactory time for the withdrawal of the samples. In female subjects it is more difficult to obtain satisfactory mixing than in males. In men the elimination of the dye in the first five minutes is practically negligible, but in women it takes place much more rapidly. After repeated injections of vital-red the subjects acquire the ability of eliminating the dye more rapidly. In men this does not occur as a rule before the sixth or seventh injection, but in women it may be present at the second. It is suggested that this phenomenon is due to increased phagocytosis of the dye particles by the cells of the reticulo-endothelial system. Neither the use of different dyes nor the lapse of one year between injections has eliminated the difficulties resulting from this rapid removal of the dye from the circulating blood. The author has tried injections of the subject's own hæmoglobin as an alternative method for the determination of blood volume, but found the method useless because of the rapid removal of the hæmoglobin from the blood. By the use of the vital-red method a mean blood weight of 5·1% of the body weight has been found. In women the values ranged from 4·8% to 16·5%—an indication of the limitation of the method with regard to sex. It is pointed out that clinically the method is further limited by the necessity of the subject carrying out the mixing movements and by the uncertainty of adequate mixing in cases of circulatory disease.

The Action of Drugs on Intraocular Pressure.

J. COLLE, P. M. DUKE-ELDER AND W. S. DUKE-ELDER (*Journal of Physiology*, January, 1931) have observed the variations in intraocular pressure following the administration of a number of drugs both in the intact animal and in the artificially perfused eye. Records were also obtained of the temperature in the anterior chamber and of contraction of the extraocular muscles. From these data, combined with direct observation of the vessels of the iris, the authors reached the following conclusions with regard to the action of drugs upon the eye uncomplicated by any general effects. Adrenalin in small doses causes dilatation of the capillaries, increases their permeability and raises the intraocular pressure. In large doses it constricts the vessels and diminishes the pressure within the eye. Doses of any size stimulate the plain muscle of the orbit, thereby tending to raise the intraocular pressure; at the same time the pupil is dilated. Pituitrin causes arteriolar constriction and lowering of the intraocular pressure; it also causes stimulation of the plain muscle of the orbit. Histamine dilates the small vessels and increases their permeability, provided that the vessels possess previously a certain degree of tone. If the vessels are relaxed before the administration of the histamine, a constriction of the arterioles is produced. In the first case histamine causes a rise, in

the second a fall of intraocular tension. Choline dilates the small vessels and stimulates the voluntary muscles of the orbit, causing a rise in intraocular pressure. Nicotine merely causes contraction of the plain and striated muscle of the orbit, thereby raising the tension of the intraocular fluids. Atropine dilates the minute vessels, increases their permeability and so raises the intraocular pressure, while it relaxes at the same time the plain muscle of the orbit and tends to lower the pressure. Physostigmine dilates the small vessels, increases their permeability and increases the tone of the voluntary muscles of the orbit, so increasing the tension within the *bulbus oculi*. Curare lowers the intraocular pressure by diminishing the tone of the extrinsic ocular muscles. The authors also concluded that there was no evidence of any secretory activity influencing intraocular pressure, but that all the changes in this pressure are compatible with the theory previously advanced by Duke-Elder that the aqueous humour is a dialysate.

BIOCHEMISTRY.

The Gastric Secretion in Normal Persons Over the Age of Sixty.

DANIEL T. DAVIS AND T. G. JONES (*Quarterly Journal of Medicine*, October, 1930) have investigated the gastric secretion of a series of persons between the ages of sixty and ninety-five years, to determine the frequency of achlorhydria and by means of the estimation of the gastric ferments to distinguish the cases of achlorhydria from those of true achylia. The effect of histamine on the gastric secretion of the persons with achlorhydria was also examined. Blood counts of all the persons with achlorhydria were compared with those of persons who had an abundant secretion of hydrochloric acid. The usual fractional test was made, the gruel meal being used and the usual findings noted. Common results in all the cases were small volumes of juice and an inhibition of secretion during the first one to one and a half hours. Out of the series examined 43 had a normal secretion of hydrochloric acid, 13 a high secretion, 12 a diminished secretion and 32 had no free hydrochloric acid. The persons with achlorhydria could by the use of histamine be divided into those with apparent and those with true achlorhydria; the percentage of those with true achlorhydria was approximately 15. The ferment content varied and was found to bear little relationship to the hydrochloric acid secretion. From none of those with achlorhydria was pepsin completely absent, and histamine was found to stimulate pepsin production as well as hydrochloric acid secretion. Although pepsin secretion was found to occur in the absence of demonstrable hydrochloric acid secretion, no person was found possessing free hydrochloric acid without pepsin. Anæmia was more often found in those with a diminished gastric secretion than in those with an abundant secretion and, although usually slight in degree and indeterminate in type, was more common in those possessing a low ferment content of the gastric juice than in those with a high ferment content. In none of these persons was there demonstrable the advanced degree of functional deficiency of the gastric secretion found in pernicious anæmia.

Experimental Hyperparathyreoidism and Osteitis Fibrosa.

A. BODANSKY, J. E. BLAIR AND H. L. JAFFÉ (*Journal of Biological Chemistry*, October, 1930) have attempted to ascertain the effect in guinea-pigs of feeding and of prolonged fasting upon the serum calcium and serum phosphorus responses to single injections of parathormone and the effects of repeated injections of parathormone upon the serum calcium and phosphorus as well as upon the bone and other tissue. Young guinea-pigs, fasting sixty hours or longer, manifested the maximum rise of serum calcium after single parathormone injections. The serum phosphorus also rose high above that of similarly fasting controls. In young fed guinea-pigs the serum calcium was definitely raised, but the phosphorus values fell mostly within the normal range, none being high enough to indicate overdosage. Similar results are found in the dog and in man with moderate doses. In adult guinea-pigs, fasting for sixty hours or longer, equal doses of parathormone on the basis of weight produced less pronounced effect on the serum calcium than in the young animals. The rise in the serum phosphorus was not so marked as in the young animals. In fed adult guinea-pigs distinct effects on the serum calcium were observed only in the twenty-four hour interval after a single injection and the serum phosphorus was only slightly above the normal range. The difference in the results of the fasting and fed guinea-pigs is attributed to the effects of the normally basic diet of these animals; other factors, such as an increased rate of excretion of calcium, may contribute to the tolerance of guinea-pigs and other herbivorous rodents to parathormone. Histological examination of the bones of young guinea-pigs after single injections of large doses of parathormone revealed severe bone lesions accompanied by decalcification; these changes were absent in adult pigs. After the administration of small and gradually increasing doses of parathormone it was found that extremely large doses could be administered daily without the development of extreme overdosage effects, enabling the animals to survive for longer periods. With the increased duration of the experiment lesions typical of *osteitis fibrosa* were produced with or without hypercalcæmia which was found to depend largely upon the size of the dose. It was found that with small doses continued for a sufficient length of time bone resorption and decalcification could be produced, although hypercalcæmia was frequently absent.

The Physiological Effects of Food Rich in Egg White

HELEN T. PARSON (*Journal of Biological Chemistry*, January, 1931) has described a nutritional disorder with speedy death of the majority of young rats when given food high in egg white, either raw or cooked, commercial, dried or fresh. The swiftness of the onset of the symptoms suggested that they were due to a direct injury from this foodstuff rather than a nutritional deficiency in the usual sense of the term. During the course of the experiments liver was found to exert a quantitative protective action, whether incorporated in the egg white ration or given during a preliminary period. Casein and beef powder were found less effective. Young rats were protected from the initial acute symptoms by as little as 5% of dried liver given for three days before the egg-white. On a ration containing 66% of dried egg white, either raw Chinese or from raw fresh eggs, some symptoms later developed in the rats which survived the first few weeks. The symptoms strikingly resembled those of pellagra, even though the rations contained 20% of potent dried yeast. The symptoms could be prevented or cured by administration of 20% of dried beef liver, but not by 10%. Lard and linseed oil were found to be ineffective either in preventing or curing the symptoms. All experimental procedures and the various symptoms that the rats exhibit are given in detail. The author concludes that his results confirm the work of Bateman and suggest the need for caution in the use of large quantities of egg white in invalid feeding. Further, the fact that eczema in children has often been observed to be associated with a sensitization to egg white raises the question as to whether the early introduction of egg white into the somewhat restricted dietary of a child may perhaps need to be safeguarded with protective foods, in somewhat the same way as was done with the diet of the rats by the author.

Hydrogen Ion Concentration and Acid-Base Equilibrium in Normal Pregnancy.

DAVID M. KYDD (*Journal of Biological Chemistry*, April, 1931) has shown that in normal pregnancy the bicarbonate of the serum falls, without change in the hydrogen ion concentration. The serum proteins are reduced at the expense of the albumin fraction, the globulin being at the normal level or relatively slightly increased. The values for sodium chloride, phosphorus and undetermined acids were found to be at the same level as in normal non-pregnant individuals. The reduction in the anions is balanced by a reduction of total base. Literature on the subject is discussed and references are given.

Special Articles on Diagnosis.

(Contributed by Request.)

LIII.

PINK DISEASE OR ERYTHRŒDEMA POLYNEURITIS.

THE symptomatology of pink disease was first described by Swift, of Adelaide, in 1914, and since then many contributions to the literature have been made by English and American writers, and notably in Australia by Jeffries Wood.

Various names—none entirely satisfactory—have been given to the condition, chief of which are pink disease, erythrœdema, polyneuritis, acrodynia and Swift's disease.

The age of onset is from four months to three and a half years, but an exceptional case was reported by Littlejohn at six years of age.

The greatest number appear between six and twelve months. In a series of fifty cases in patients at the Royal Alexandra Hospital for Children, whose histories I recently examined, four, or 8%, appeared between four and six months, thirty-eight, or 76%, appeared between six and twelve months, six, or 12%, appeared between twelve and eighteen months, two, or 4%, appeared between eighteen months and four years.

Breast-fed babies, previously healthy and well nourished, are the most common sufferers from the disease, but bottle-fed babies do not enjoy complete immunity. In this series 66% were breast fed, 10% artificially fed, and in 24% the history was not clear.

The earliest and most predominant symptom is intense irritability. The child becomes restless and intolerably petulant, it winges and cries day and night, resents every attention and renders the lot of its distracted parent an unenviable one.

Accompanying this irritability are usually a diffuse rash and a mild coryza.

The rash is most marked on the covered parts, but extends widely over the trunk, face and limbs. It is pink in colour and closely resembles in many cases the eruption known as prickly heat; in others it consists of a diffuse erythema with scattered papules.

Profuse sweating which drenches the child's clothing is a constant accompaniment. The skin is extremely irritable—the child makes constant efforts to scratch its face and hands, and rubs its back to and fro against the bed clothes in a vain endeavour to obtain relief. Large sloughs and deep ulceration of the buttocks may be caused by these persistent movements. Ulcerative stomatitis frequently appears in the early stage and extensive sloughing in the mouth is not uncommon.

The unhappy child suffers severely from insomnia, and its intense dislike of food renders it extremely difficult to feed. As a result weight is rapidly lost and a condition of extreme muscular hypotonia develops. The muscles become so soft and flabby and the ligaments and skin so loose that the limbs can be hyperextended to an extraordinary degree.

The knee jerks are diminished or lost altogether. It is said that sensibility to pin prick is diminished in the lower limbs, but the practical difficulty of eliciting such a sign in these children is very great. The most characteristic feature of the disease is the reddish-pink colour of the hands and feet, tip of the nose, and sometimes of the ears and cheeks.

The hands and feet become icy cold and clammy, and have an extraordinarily swollen, sodden appearance, but do not pit on pressure. The superficial layers of the epidermis of the palms and soles often desquamate and the finger and toe nails may drop off.

The colour does not as a rule extend beyond the proximal phalanges of the hands and feet and is almost invariably limited to the parts distal to the wrist and ankle.

Another striking but more variable sign is photophobia; it occurred in 58% of the cases of this series. When present, it is a valuable aid in diagnosis. The eyes are screwed up and the child makes strenuous efforts to avoid their exposure to light. It huddles up in an attitude of extreme flexion and buries its face in the bed clothes or its mother's breast. The eyelids give the impression of being pinkish in colour, but there is no evidence of conjunctivitis or organic eye disease.

Obstinate constipation and sluggish peristalsis are common, and are probably due to the hypotonic condition of the intestinal musculature. This often alternates with periods in which the motions are loose, frequent and offensive.

The lymphatic glands of the groin, axilla and neck are sometimes enlarged as a result of infection of the skin, which is so common. Rapidity of the pulse is a constant feature; its usual range is from 120 to 160 per minute.

The temperature is seldom raised, except in the presence of complications.

An increased leucocyte count, with a preponderance of neutrophile cells, is common, but it is difficult to determine whether this is due to the disease itself or to secondary infections.

No diminution of the blood calcium or phosphorus was noted in any of the cases in which this examination was made.

Complications frequently occur and are usually due to bacterial invasion. The most common are bronchitis and bronchopneumonia. Bronchopneumonia ranks first among the causes of death in pink disease, and its importance may be gauged from the fact that in this series of cases no less than 20% of the total number die from this complication. Gastro-enteritis also occurs, but by no means so frequently or with such fatal results.

Pyuria is common and was present in 14% of the cases of this series. The intense skin irritation and inevitable scratching often causes furunculosis and abscess formation, and osteomyelitis is an occasional sequel.

The course of the disease is prolonged, seldom is any improvement noted under three months, and full recovery is rare before six or even twelve months from the onset. During this period constant irritability, anorexia and insomnia persist, the hands and feet remain pink, cold and clammy, the skin excessively moist, and wasting and hypotonia become more marked.

Improvement in favourable cases is first shown by a lessening of the irritability and gain in weight, and when recovery takes place it is usually complete without residual symptoms.

The prognosis is much graver than the original papers on this subject indicated. Jeffries Wood called attention to this in 1927 when he recorded a series of 31 cases with 10 deaths. In the present series of 50 cases death occurred in 19. Eleven of these patients died from pneumonia and the remaining eight from inanition. Sudden death without warning occurred in three cases, and this constitutes one of the alarming features of the disease.

Errors in diagnosis are most often made by considering individual symptoms without due regard to the whole condition. Meningitis, *otitis media* or cerebral abscess may be suspected on account of the intense irritability. Pyelitis may be diagnosed if, in addition, pus cells are found in the urine.

The marked wasting with hypotonia and sweating may suggest rickets, which indeed frequently accompanies pink disease, and the underlying condition may be overlooked. The rash may be confused with one of the exanthemata or with eczema. The presence of photophobia may lead to the diagnosis of some eye condition, such as iritis or conjunctivitis. And so not infrequently the child is referred to the ophthalmologist or dermatologist. The possibility of poliomyelitis as a diagnosis may be considered on account of the muscular wasting and diminution of deep reflexes.

Lastly, the blame may be laid at the door of the homely old-fashioned tooth in its process of eruption.

If, however, the characteristic signs and symptoms are looked for and recognized, the correct diagnosis is made without difficulty.

For a baby who suffers from intense irritability, insomnia and anorexia and exhibits a diffuse rash with excessive sweating and hypotonia, reddish pink, icy-cold

hands and feet, and photophobia, presents one of the most striking pictures seen in clinical medicine.

WILFRED EVANS,
M.B. (Sydney), M.R.C.P. (London),
Honorary Assistant Physician, Sydney Hospital; Honorary Assistant Physician, Royal Alexandra Hospital for Children, Sydney.

British Medical Association News.

SCIENTIFIC.

A MEETING OF THE SOUTH AUSTRALIAN BRANCH OF THE BRITISH MEDICAL ASSOCIATION was held at the Darling Building, University of Adelaide, on April 30, 1931, DR. C. E. C. WILSON, the President, in the chair.

Radiology in Diagnosis.

DR. H. A. McCOY read a paper entitled: "Radiology in Diagnosis" (see page 77).

DR. H. C. NOTT demonstrated an X ray film projector (see page 79).

Meningioma of the Olfactory Groove.

DR. H. McI. BIRCH read the clinical history of a male patient, a Swede, aged forty-four years, who was admitted to the Parkside Mental Hospital in June, 1927. At the time the patient was a robust man. His pupils were equal, were dilated and reacted well to light. He was blind. His knee jerks were equal and active. His sense of smell was not tested. Examination of the optic discs revealed primary optic atrophy. In the cerebro-spinal fluid a considerable amount of globulin was present, there was no increase in the white cells and the colloidal gold curve was normal. The blood did not react to the Wassermann test. No other neurological signs were found.

The patient was unable to give a connected account of his previous history, he was delusional and had hallucinations of hearing. He was unduly emotional, crying when questioned, and he appeared to be frightened when approached. About every six months the patient had a series of epileptiform seizures, usually about a dozen in twenty hours. He would then resume his previous state, which showed no appreciable alteration till his death in March, 1931. A few months before his death he developed pulmonary tuberculosis, which ran a very rapid course.

PROFESSOR J. BURTON CLELAND described the pathological specimen, which was a meningioma of the olfactory groove of the ethmoid.

NOMINATIONS AND ELECTIONS.

THE undermentioned have been elected members of the Victorian Branch of the British Medical Association:

Deans, Berwyn Lincoln, M.B., B.S., 1930 (Univ. Melbourne), Melbourne Hospital, Melbourne, C.1.
Thompson, George Charles Victor, M.B., B.S., 1931 (Univ. Melbourne), 17, Collingwood Road, Newport, W.15.
Soccorso, Santoro, M.D., Ch.D., 1926 (Genova), 110, Collins Street, Melbourne, C.1.
Bianchi, Pietro, M.D., Ch.D., 1926 (Genova), 110, Collins Street, Melbourne, C.1.
Beaumont, Ivy Camille, M.B., B.S., 1929 (Univ. Melbourne), Base Hospital, Bendigo.
Jones, Basil Owen, M.B., B.S., 1927 (Univ. Melbourne), Alfred Hospital, Prahran, S.1.

The Royal Australasian College of Surgeons.

NEW ZEALAND MEETING.

THE annual meeting of the New Zealand Fellows of the Royal Australasian College of Surgeons will be held at Auckland on September 3 and 4, 1931. The programme is as follows:

Thursday, September 3.

Morning: Operations by Fellows.
Afternoon: Demonstration of X ray films.
4.30 to 6.30 p.m.: Business meeting.

Friday, September 4.

Morning: Operations by Fellows.
Afternoon: Ear, nose and throat demonstration; pathological specimens.
Evening: Dinner.

Congresses.

FRENCH CONGRESS OF STOMATOLOGY.

THE seventh French Congress of Stomatology will be held at Paris in October, 1932, under the presidency of Dr. Bozo, of 22, Rue du Fanbourg St. Honoré, Paris. The Secretary is Dr. A. Lattès, 54, Boulevard St. Michel, Paris, from whom fuller information may be obtained.

Proceedings of the Australian Medical Boards.

NEW SOUTH WALES.

THE undermentioned have been registered under the provisions of the *Medical Act*, 1912 and 1915, as duly qualified medical practitioners:

Finch, Hugh Earnshaw, M.B., B.Ch., 1898 (Oxford), D.P.H., R.C.P. and S., England, 1900, Deepwater.
Ilberry, Josiah Edward, M.B., Ch.B., 1930 (Edinburgh), Barry Street, Neutral Bay.
Smithers, Ernest Eric, L.R.C.P. (Edinburgh), L.R.C.S. (Edinburgh), L.R.F.P.S. (Glasgow), 1931, Warners Avenue, Bondi.

Correspondence.

CANCER ORGANIZATION IN AUSTRALIA.

SIR: In an article on "The Australian Cancer Organisation," published in *The Lancet*, August 9 and 16, 1930, Dr. Arthur Burrows, formerly Radium Advisor to the Commonwealth Government, writes that:

> The movement which led to the establishment of a modern cancer organization in Australia had its origin in events about six or seven years after the end of the war. A group of public-spirited individuals formed a cancer treatment and research committee in Sydney, appealed for funds and raised £130,000 in Sydney and New South Wales. The successful treatment of an Australian patient by radium in America, under conditions which attracted some public attention, led also to representations being made to the Commonwealth

Government pointing out the necessity for the provision of satisfactory radium treatment in Australia. As a result of further inquiries this government decided to purchase 10 grammes of radium, and a radium advisor was appointed to see that it was properly distributed and effectively used.

The remark is made later that: "In Sydney the cancer research committee has been constituted a committee of the University."

These statements fail to give an accurate account of the date and evolution of cancer organization in Australia, which had existed for some years previous to the national campaign, which has been largely based on the Commonwealth purchase of radium.

The report of the Senate of the University of Sydney to His Excellency the Governor and to his Executive Council for the year ending December 31, 1922, states that in 1922 the Senate of the University of Sydney nominated a number of professors as a committee of direction to advise it as to what action might be taken in regard to a gift of £7,000 made to the University of Sydney for the study of problems of cancer. The Senate had appointed in November, 1921, the Cancer Research Committee (a committee of the Senate), which has remained in commission until the present time. As is well known, legally the Senate constitutes the University of Sydney. The Cancer Research Committee is therefore a committee of a legally incorporated authority, namely, the University of Sydney. The various public-spirited individuals who so generously worked for the benefit of those suffering from cancer, were members of this committee, duly appointed from time to time by the Senate. Every decision of the Cancer Research Committee has been submitted to the Senate, and all action that has followed has been authorized by the Senate. Further, the Senate has given much consideration to the recommendations of the Cancer Research Committee and has repeatedly amended its recommendations. The suggestion that the Cancer Research Committee is a voluntary organization, which has previously been made in the official publications of the Federal Department of Health, is only correct in the sense that no remuneration is paid to members of the Cancer Research Committee for their services on the Committee, as is also the case for service by persons as members of the Senate of the University.

The report of the Senate for the year ending December 31, 1923, states that in November the Cancer Research Committee placed before the Senate arguments in favour of the initiation by the University of a cancer research campaign in New South Wales. The same report proceeds later to set out that the Senate, after full consideration of the report of the Committee, decided (1) to ask the Committee of Direction to prepare a pamphlet for publication by the Cancer Research Committee setting out the manner in which the funds raised for cancer research were to be applied, and (ii) to appoint a special committee of business men to draw up a financial scheme for production to the Senate through the Cancer Research Committee. In its report for the succeeding year the Senate states that in 1924 the cancer research organization had been extended. To the original Cancer Research Committee a number of business men had been added.

The organization of a cancer campaign in New South Wales was discussed, at the request of the University, in the Town Hall, Sydney, at a public meeting at which His Excellency the Right Honourable Lord Forster, Governor-General, took the chair, in April, 1925. Early in 1926 the University of Sydney and the Government of New South Wales jointly invited Dr. Burrows to prepare a comprehensive report on the establishment of a radium centre in Sydney. A most valuable report was prepared by Dr. Burrows, setting out the design of a radiotherapeutic institute or the necessary provision of buildings in a hospital; staff, equipment, provision of radium, forms of applicators and general methods of use. This report was made available to the Commonwealth Government and furnished much information to the Federal Department of Health when the decision was made later by the Federal Government to purchase radium. In 1925 the University of Sydney set aside a portion of the new physics building for a cancer department, and the earliest appointments to the research staff were made in that year.

No Australian cancer organization is in existence. In 1926 the Senate of the University of Sydney endeavoured to obtain the assistance of the late Sir Neville Howse, Federal Minister for Health, for the appointment of a coordinating authority through the agencies of the Commonwealth Government. Despite several efforts by the officers of the University of Sydney and of the Queensland Cancer Trust to bring about this desirable result, no Australian cancer organization has so far been estabilshed. Nevertheless, through the timely offices of the Federal Department of Health, two annual cancer conferences have been held at Canberra, at which some of the problems have been discussed.

Yours, etc.,

HENRY G. CHAPMAN,
Director of Cancer Research,
The University of Sydney.

June 18, 1931.

BRANCH SUBSCRIPTIONS.

SIR: Dr. Arthur Morris thinks (THE MEDICAL JOURNAL OF AUSTRALIA, June 13, 1931) that £4 16s. 6d. is too much to pay for membership of the British Medical Association, and suggests three ways of reducing this amount. My opinion is that such a sum could be spent much less usefully. As to ways of reduction: (1) To me *The British Medical Journal* and sometimes THE MEDICAL JOURNAL OF AUSTRALIA act as consultants together with my books of reference in a practice where I am peculiarly isolated from my *confrères*; neither journal is ever left unread by me. Often when I have been in doubt some article or statement just comes along to help me or to justify my action. (2) Being at heart an intense Briton (I was born in India, educated in Edinburgh, and adopted by Australia many years ago), I count it an honour to be a member of the British Medical Association.

With Dr. Morris's third suggestion I agree entirely.

Yours, etc.,

A. G. E. NAYLOR.

Loch, Victoria,
June 16, 1931.

MEDICAL SERVICES TO NATIVES IN CENTRAL AUSTRALIA.

SIR: In the journal for June 20 a satisfactory reference is made to the attention being given by the British Medical Association to the medical services to the aborigines, of whom I understand there are 60,000 in Australia, together with 16,000 half-castes, whose number is increasing. Two matters, however, seem to me to require comment. It is stated that no information was submitted in support of the statement that contagious diseases were prevalent. At a meeting of the Victorian Branch of the British Medical Association I showed photographs prepared by Dr. Walker, of Adelaide, and Mr. Herschell, of Pathé Cinema. Both photographs showed venereal disease in aborigines of an appalling character owing to neglect of treatment. The photographs were taken from aborigines in different parts of Australia. I have the photographs and lantern slides in my possession and will make them available to anyone who requires them. In fact, the late Minister of Home Affairs was just a little inclined to criticize me for showing them.

About the necessity for treatment there can be no question.

In the second place, the reference made to the training of native orderlies is to me not convincing. Australia has never quite realized not only what is done in the Mandated Territories by native orderlies, but the admirable work which is being done in Fiji in the training of native practitioners who, after a three years' course at the Suva

Memorial Hospital, are employed as health officers in the various islands of the Pacific and as practitioners amongst their own people. They are further employed by Europeans where no European practitioner is available and the European desires it. Some Europeans spoke to me in the highest terms of the help given by these practitioners in an emergency.

From what I have seen of the half-castes in northern New South Wales and of their efficiency in such work as the erection of fences *et cetera*, I think that such people trained by the Fiji method and understanding the mentality of the aborigines might be of great service. At all events I ask those who realize the obligations we owe to the aborigines to examine the Fiji method for themselves. The school has been conducted by the Government of Fiji with the cooperation of the Rockefeller Foundation. A journal has just been published for the benefit of these native practitioners, to which I have had the honour of being invited to contribute, an invitation which I greatly appreciate and accepted at once.

Yours, etc.,

JAMES W. BARRETT.

103-105, Collins Street,
Melbourne,
June 26, 1931.

HOSPITAL ABUSE.

SIR: There have been rumblings for a long time that "something must be done" to overcome the menace of the increasingly abused use of public hospitals, but isolated instances of attempt to do so have been so far futile.

Could we not as a body definitely pronounce that the only patients who will be attended to in public hospitals are emergency cases and those presenting a note from a practitioner? Those unable to afford a primary consultation fee would, I am sure, be gladly supplied by any practitioner with a printed form authorizing treatment.

An examination of the addresses of any hospital's public patients would verify that every medical practitioner throughout the length and breadth of the country is vitally affected by this growing abuse of what was originally the privilege of the poor.

An effort to overcome this sorry state of affairs would have the whole-hearted support of the various hospital authorities, as "the lady with the fur coat" and the parent waiting in the motor car for the tonsillectomy child are notoriously acknowledged to be the leanest of contributors.

For the sake of the future of our profession I suggest an expression of opinion through these columns, and if sufficient interest is shown, the subject may become a platform of election to executive positions.

Yours, etc.,

KEN S. SMITH.

249, Darlinghurst Road,
Darlinghurst,
July 10, 1931.

Obituary.

CARL PETER WILHELM DYRING.

WE regret to announce the death of Dr. Carl Peter Wilhelm Dyring, which occurred at Brighton, Victoria, on July 4, 1931.

MAVIS STELLA ENGELBRECHT.

WE regret to announce the death of Dr. Mavis Stella Engelbrecht, which occurred on July 8, 1931, at Albert Park, Victoria.

CLIVE VALLACK SINGLE.

WE regret to announce the death of Dr. Clive Vallack Single, which occurred on July 10, 1931, at Woollahra, New South Wales.

JOHN HARDIE MACARTHUR.

WE regret to announce the death of Dr. John Hardie Macarthur, which occurred on July 12, 1931, at Sydney, New South Wales.

University Intelligence.

THE UNIVERSITY OF SYDNEY.

A MEETING of the Senate of the University of Sydney was held on July 8, 1931.

The degree of Master of Surgery (Ch.M.) was conferred *in absentia* upon Henry Patrick Blaney, of Biloela, Queensland.

The following diplomas were awarded:

Diploma in Public Health: C. E. Cook, M.D., Ch.M., G. E. Moore, M.B., B.S.

Diploma in Tropical Medicine: W. L. Calov, M.B., Ch.M., A. J. Geoffroy, M.B., Ch.M., A. E. Platt, M.B., B.S., D. A. Pritchard, M.B., Ch.M., B.Sc., B. A. Sinclair, M.B., Ch.M.

Dr. Æneas J. McDonnell (M.D., 1896), one of the earliest graduates of the Medical School, has presented to the University an aquatint engraving of the entrance to the McDonnell Theatre in Toowoomba Hospital. The engraving is the work of Mr. Lionel Lindsay.

The following appointments were made:

Mr. H. S. Parker, B.Sc., as Chemist in the Department of Organic Chemistry.

Dr. Sylvia D. Bray as Radium Registrar at Sydney Hospital.

Professor Fairfax Reading has been asked by the Senate to continue as Professor of Dentistry until the 31st of December, 1932.

Books Received.

ABDOMINAL PAIN, by John Morley, Ch.M., F.R.C.S., with an introduction by J. S. B. Stopford, M.D., F.R.S.; 1931. Edinburgh: E. and S. Livingstone. Demy 8vo., pp. 206, with illustrations. Price: 10s. 6d. net.

PRACTICAL METHODS IN THE DIAGNOSIS AND TREATMENT OF VENEREAL DISEASES FOR MEDICAL PRACTITIONERS AND STUDENTS, by David Lees, D.S.O., M.A., M.B., D.P.H., F.R.C.S., M.R.C.P., with introduction by W. Robertson; Second Edition; 1931. Edinburgh: E. and S. Livingstone. Crown 8vo., pp. 654, with illustrations. Price: 5s. net.

FUNDAMENTALS OF DERMATOLOGY, by Alfred Schalek, M.D.; Second Revised Edition; 1931. Philadelphia: Lea and Febiger. Demy 8vo., pp. 258, with illustrations. Price: $3.00 net.

THE SEXUAL LIFE OF MAN, AN OUTLINE FOR STUDENTS, DOCTORS AND LAWYERS, by Dr. Placzek; Second Edition; Translated by L. S. Morgan, M.R.C.S., L.R.C.P.; 1931. London: John Bale, Sons and Danielsson. Crown 8vo., pp. 334.

HIGH FREQUENCY PRACTICE WITH APPENDIX FOR PRACTITIONERS AND STUDENTS, by B. B. Grover, M.D.; Sixth Edition; 1931. Kansas City: The Electron Press. Royal 8vo., pp. 648, with illustrations. Price: $7.50 net.

A STUDY OF HAIRS AND WOOLS BELONGING TO THE MAMMALIAN GROUP OF ANIMALS, INCLUDING A SPECIAL STUDY OF HUMAN HAIR CONSIDERED FROM THE MEDICO-LEGAL ASPECT, by John Glaister, Junior, D.Sc., M.D., J.P.; 1931. Cairo: Misr Press. Demy 4to., pp. 187, with 110 plates.

PRACTICAL MEDICINE SERIES: NERVOUS AND MENTAL DISEASES; Series 1930. Chicago: The Year Book Publishers. Crown 8vo., pp. 451. Price: $2.25 net.

PRACTICAL MEDICINE SERIES: DERMATOLOGY AND UROLOGY; Series 1930. Chicago: The Year Book Publishers. Crown 8vo., pp. 474. Price: $2.25 net.

EGYPT: THE HOME OF THE OCCULT SCIENCES, WITH SPECIAL REFERENCE TO IMHOTEP, THE MYSTERIOUS WISE MAN AND EGYPTIAN GOD OF MEDICINE, by T. G. Garry, M.D., M.Ch., M.A.O., M.B.E.; 1931. London: John Bale, Sons and Danielsson Limited. Crown 8vo., pp. 98. Price: 7s. 6d. net.

THE TEETH, THE BONY PALATE AND THE MANDIBLE IN BANTU RACES OF SOUTH AFRICA, by J. C. M. Shaw, M.A., B.Dent.Sc., D.D.S., F.I.C.D.; with a foreword by Sir Arthur Keith; 1931. London: John Bale, Sons and Danielsson Limited. Demy 4to., pp. 150, with illustrations. Price: 12s. 6d. net.

TEXTBOOK OF HISTOLOGY FOR MEDICAL AND DENTAL STUDENTS, by E. C. Piette, M.D.; 1931. Philadelphia: F. A. Davis Company. Royal 8vo., pp. 476, with 277 illustrations, some in colour.

ANNUAL REPORT OF THE SURGEON-GENERAL OF THE PUBLIC HEALTH SERVICE OF THE UNITED STATES FOR THE FISCAL YEAR 1930. Washington: United States Government Printing Office. Royal 8vo., pp. 365. Price: 75 cents.

THE CARDIAC CYCLE, by H. Sainsbury, O.B.E., M.D.; F.R.C.P.; 1931. Bristol: John Wright and Sons Limited. Demy 8vo., pp. 79, with diagram. Price: 5s. net.

Diary for the Month.

JULY 21.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
JULY 22.—Victorian Branch, B.M.A.: Council.
JULY 24.—Queensland Branch, B.M.A.: Council.
JULY 28.—New South Wales Branch, B.M.A.: Medical Politics Committee.
JULY 30.—South Australian Branch, B.M.A.: Branch.
JULY 30.—New South Wales Branch, B.M.A.: Branch.
AUG. 4.—New South Wales Branch, B.M.A.: Organization and Science Committee.
AUG. 5.—Victorian Branch, B.M.A.: Branch.
AUG. 6.—South Australian Branch, B.M.A.: Council.
AUG. 7.—Queensland Branch, B.M.A.: Branch.
AUG. 11.—New South Wales Branch, B.M.A.: Ethics Committee.
AUG. 13.—New South Wales Branch B.M.A.: Clinical Meeting.
AUG. 18.—New South Wales Branch, B.M.A.: Executive and Finance Committee.

Medical Appointments.

Dr. J. L. Kerr has been appointed Quarantine Officer, Beauty Point, Tasmania, pursuant to the provisions of the *Quarantine Act*, 1908-1924.

* * *

Dr. A. L. Tostevin (B.M.A.) has been appointed Acting Honorary Assistant Ophthalmologist at the Adelaide Hospital, South Australia.

* * *

Dr. N. S. Gunning has been appointed Honorary Clinical Assistant to the Ophthalmological Department at the Adelaide Hospital, South Australia.

* * *

Dr. E. A. Eddy (B.M.A.) has been appointed Government Medical Officer at Finley, New South Wales.

* * *

Dr. N. A. Walker (B.M.A.) has been appointed Government Medical Officer at Woodburn, New South Wales.

* * *

Dr. A. R. Southwood (B.M.A.) has been appointed Acting Chairman of the Central Board of Health and Vaccination Officer, also Acting Chairman of the Advisory Committee, pursuant to the provisions of the *Food and Drugs Act*, 1908, South Australia.

Medical Appointments Vacant, etc.

FOR announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser," page xvi.

COMMONWEALTH OF AUSTRALIA: Government Medical Officer.
ROYAL ALEXANDRA HOSPITAL FOR CHILDREN, SYDNEY, NEW SOUTH WALES: Honorary Officers.
THE BRISBANE AND SOUTH COAST HOSPITALS BOARD, QUEENSLAND: Assistant General Medical Superintendent.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCH.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company, Limited. Phœnix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane.	Members desiring to accept appointment in ANY COUNTRY HOSPITAL, are advised to submit a copy of their agreement to the Council before signing, in their own interests. Brisbane Associated Friendly Societies' Medical Institute. Mount Isa Hospital. Mount Isa Mines. Toowoomba Associated Friendly Societies' Medical Institute.
SOUTH AUSTRALIAN: Secretary, 207, North Terrace, Adelaide.	All Lodge Appointments in South Australia. All Contract Practice Appointments in South Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 65, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.
NEW ZEALAND (Wellington Division): Honorary Secretary, Wellington.	Friendly Society Lodges, Wellington, New Zealand.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

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